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# BULLETIN

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## PRELIMINARY NOTE OF A CASE OF INFECTION WITH BALANTIDIUM COLI (STEIN).

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AND

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*(From the Army Pathological Laboratory, Manila, P. I.)*

Balantidium coli (Stein), (Paramecium coli—Malmsten) was probably first observed by Leeuwenhoek. In a diarrhœa of considerable duration, he examined his own stools and recognized in them small motile animals, which, he stated, were about the size of red blood-corpuscles, and moved by means of small "fussartig" formations.

Leuckart intimated that the size of the parasite, as given by Leeuwenhoek, probably rested on a guess, as the latter author was not able to notice any flagella with the microscope of his time.

Malmsten,[1] in 1857, in Stockholm, first described the parasite in a patient who, for two years following a case of cholera, had suffered at first from digestive troubles and later from a painful diarrhœa. On examination of the patient he found, about an inch above the anus, a small wound, which excreted a thin, bloody pus. A great number of the parasites were constantly found in this discharge and also in the intestinal mucus and fæces. The condition of the patient improved considerably with the decrease in the number of the parasites. Lowen classified these parasites as belonging to the genus Paramecium.

In a second case Malmsten found the parasite in the bloody pus-like excretions of a woman suffering from a severe intestinal catarrh. The woman died. At necropsy, he states, the parasites were found on the healthy mucous membrane

[1] Malmsten: Infusorien als Intestinal-Thiere beim Menschen. Virchow's Archiv, Bd. xii, p. 302.

of the cæcum and in the vermiform appendix. They were, however, missing entirely in the small intestine. In small numbers they were found in the ulcers of the large intestine.

In 1862 Stein proposed the name Balantidium coli for the parasite.

In 1891 Mitter[2] was able to collect from the literature twenty-eight cases of infection with this parasite. Since this date, De la Chappelle[3] (1896), has reported two other cases in man. The article of this latter author is not at hand.

Henschen especially emphasizes the pathological importance of this parasite, but other authors are inclined to the belief that its presence should only be considered as an accidental, unimportant complication. The latter view is the one which is generally expressed in our recent text-books regarding this parasite. Thus Opie[4] (1900), in his article on Protozoa, concludes that Balantidium coli is apparently an accidental parasite which finds favorable conditions for growth in the diseased intestine and that it is improbable that the organism is the etiological factor in the production of the diarrhœa with which it is associated.

We wish to contribute another case to the literature of infection with this parasite.

The patient observed by us had lived in northern New England and came to the Philippine Islands in December, 1899. There was no history of previous diarrhœa. He stated that he had been perfectly well until April, 1900, when he began to have diarrhœa which continually grew worse. He entered the hospital here on June 9. From this date up to the time of his death, August 11, he had continuous, uncheckable, severe diarrhœa.

He became extremely emaciated before his death. During life, the blood-examination showed a relative increase in the number of the eosinophiles. The stools showed large numbers of flagellate infusoria measuring from 70$\mu$ to 110$\mu$ long by 60 to 72$\mu$ broad. The periphery is covered with fine actively motile cilia. At the anterior end is a funnel-shaped entrance which is surrounded by cilia and when the parasite is moving, gives the appearance of a paddle-wheel revolving. An ectosarc and endosarc may be distinguished, and the parasite possesses the power to change its shape and may appear quite round. The endosarc contains a large somewhat kidney-shaped nucleus and two contractile vacuoles. The surface is lightly striated longitudinally. In the posterior end is an anus from which particles were observed, at times, to pass. The anterior end is more pointed than the posterior and more tapering. For some days before death, each drop of the patient's fæces, placed beneath a cover-glass, contained between 100 and 200 of these infusoria. The stools contained no other parasites, but mucus, blood and epithelial cells were present.

At necropsy, in the lower portion of the jejunum and ileum the mucosa was reddened and contained considerable mucus. In the large intestine the mucosa throughout was covered with bloody mucus which was easily washed off; beneath this layer the mucosa itself was very much reddened. There were a number of shallow ulcerations present in the mucosa whose edges were not undermined; their bases and margins had a blackish pigmented appearance.

Agar plate cultures from the heart, spleen, liver and kidneys were negative for organisms.

Sections of the large intestine stained in hæmatoxylin and eosin show Balantidium coli all through the mucosa and passing through the muscularis and submucosa; some of the sections show the parasites lying along the intermuscular septa of connective tissue and penetrating for a short distance between the muscular layers. There is an extensive eosinophilia in the mucosa, muscularis mucosa, submucosa and lymph follicles. The process seems more marked in the submucosa. The mucosa shows areas of necrosis and of hæmorrhage, with cellular infiltrations and desquamation of cells. In the submucosa there are also infiltrations of round cells; the vessels are injected and often about the veins which contain the parasites small hæmorrhages have occurred. The lymph follicles are swollen. The liver shows small areas composed of round cells.

We cannot regard this parasite as a harmless one, for we could not explain the persistent diarrhœa of our patient without regarding it as the exciting cause, nor were we, from the lesions found at necropsy, enabled to explain his death in another way. A complete report of this case will appear shortly.

October 4, 1900.

[2] Mitter: Beitrag zur Kenntniss des Balant. coli. Inaug. Diss., Kiel 1891.

[3] De la Chapelle: Finska läk.-sällsk. handl., Helsingfors, 1896; xxxviii, 1041.

[4] Opie: Twentieth Century Practice of Medicine, vol. xix, 1900.

# HYPEREXTENSION AS AN ESSENTIAL IN THE CORRECTION OF THE DEFORMITY OF POTT'S DISEASE, WITH THE PRESENTATION OF ORIGINAL METHODS.[1]

By R. Tunstall Taylor, B. A., M. D.,

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Any successful treatment of tubercular spondylitis must be based on a careful consideration of the anatomical, pathological and mechanical problems involved, and any method determined on must stand the test of clinical experience before acceptance.

Let us first consider briefly some of the chief anatomical features of the spine from the standpoint of the mechanics

[1] Read, in part, at the Fourteenth Annual Meeting of the American Orthopedic Association, on May 2, 1900, Washington, D. C.

in the causation and in the treatment of this tubercular osteitis of the vertebræ.

The vertebral column as a whole consists of four curves when viewed laterally—a convexity forward in the cervical region, a convexity backward in the dorsal region, a convexity again forward in the lumbar region and backward in the sacral.

The three first-mentioned curves, with which we are only concerned, are subject to variations dependent on whether the individual is standing or sitting, and also whether the observation is made on rising in the morning or late in the evening, being in the latter cases more marked.

It has been shown by Brackett [2] that recumbency in a prone position lessens these curves, and supine recumbency has been used from time immemorial as an efficient means of treating spinal curvatures.

Suspension by the head and hands also renders these physiological curves, if we may so designate them, less appreciable. Le Vacher [3] demonstrated this in 1768 in his "L'arbor suspendens" attached to a corset.

The "jury-mast," for which Lee [4] gives the credit to J. K. Mitchell in 1826, and Lee's own "self-suspension spinal swing," devised in 1866, confirmed this observation. We know now, however, that these physiological curves are chiefly lessened by suspension and not the curves due to tubercular disease as the earlier observers thought.

In the erect posture the spine must bear the superincumbent weight of the head, and by means of the ribs and diaphragm also the weight of the thoracic viscera, and, to a certain extent, the liver and other abdominal organs. Further, through the sternal attachments of the shoulder girdle and the anterior situation of the arms, there is to a certain extent also, a drag downward and forward on the dorsal spine by them.

If the spine, as a whole, is viewed in profile in either a skeleton or a fresh specimen, it will be seen that a vertical line drawn through the bodies of the cervical vertebræ will pass anterior to the dorsal vertebræ, not touching them, but in the lumbar region such a line will again reach the vertebral bodies. Thus, from an anatomical standpoint, we may conclude that the mechanics of the spinal column decidedly predispose to a *dorsal* convexity, or kyphosis, even without the addition of disease, which the continuity of the vertebral bodies and interverbral fibrocartilages antagonize anteriorly, and the ligamenta flava, inter- and supraspinalia posteriorly.

Secondly.—From the pathological findings in caries of the vertebræ, since the time of Sir Percival Pott (1779), observers have noted that the less compact bodies of the vertebræ are the seat of the tubercular osteitis, softening and disintegration and not the denser articular and transverse processes, as a rule. As a result of this in untreated, maltreated and neglected cases, the characteristic deformity has occurred, *i. e.*, the superior and inferior edges of the bodies of the involved vertebræ have come into closer contact anteriorly and the spinous processes are more widely separated than is normal (Fig. 1). In addition, unless means are adopted to check this, the healthy vertebral bodies will come into contact with those diseased, and from the traumatic irritation produced thereby and the contiguity, the healthy vertebræ will also become involved in the process and so the diseased area will extend.

What, then, can we gather from this, as the indication for the treatment to combat this normal and pathological tendency to kyphosis? Manifestly it is the maintenance of hyperextension of the spine until all danger of extension of the tubercular process is passed and firm cicatrization has occurred from the layer of non-tubercular granulation tissue, which is converted in time into fibrous tissue, cartilage or bone and locks the vertebral bodies or processes together inseparably by ankylosis.

I have illustrated this diagrammatically (Fig. 2): Let Fig. 2*A* represent two healthy vertebræ seen in profile. The parallel lines represent the superior and inferior planes of those bodies. The centre of gravity or weight-bearing line is indicated by the dotted line, seen to pass through the centre of the vertebral bodies. The alignment of the spinous processes is seen to be straight.

In Fig. 2*B* we see the result of an untreated tubercular process where the bodies have collapsed, the planes of the superior and inferior surfaces converge and meet anterior to the vertebral column and the spinous processes are widely separated. The centre of gravity line is thrown further forward, tending to increase the deformity. The separation of the spinous processes shows the characteristic contour of the hump-back.

In Fig. 2*C* is shown what should be the aim of treatment; the separation of the vertebral bodies as far as the ligamentous and muscular attachments will permit; the throwing of the centre of gravity back on the articular processes and the crowding together of the spinous processes. We cannot say that a true separation of the vertebral bodies really occurs by hyperextension before extensive bone destruction has taken place, but certainly intravertebral pressure is lessened on the bodies thereby. On the other hand, Bradford and Cotton's [5] experiments lead us to suppose in extensive unhealed disease such a separation certainly occurs in hyperextension.

To meet this aim of treatment, in the latter part of 1894 I presented before the Johns Hopkins Medical Society [6] what I termed an apparatus for applying plaster jackets on the plaster jacket stool on which the patient sat, with the pelvis fixed, the arms extended upwards and backwards, and traction was made on the head by means of a head-sling. The result of this attitude on the spine was lordosis. In that paper, as far as I can find out in the literature, I first called

[2] Bradford and Lovett, Orthopedic Surgery, 2d edition, 1899, 53.

[3] Memoirs de l'Académie royale de chirurgie, Paris, 1768, tome (4).

[4] Transactions American Orthopedic Assoc., vol. iv, 244.

[5] Boston Med. and Surg. Jour., Sept. 20, 1900, 279–280.

[6] Johns Hopkins Bulletin, No. 45, February, 1895, and Medical News, March 23, 1895.

attention to and demonstrated clinically the importance of extending the spine backwards (hyperextension) and the maintenance of this position by means of plaster of Paris jackets for the prevention or correction of the natural tendency of the deformity of Pott's Disease (Fig. 3). However, Hadra in 1891 suggested the same principle by wiring the spinous processes together, "thereby relieving the vertebral bodies," but in the article it is stated he has not done this operation in Pott's Disease.[7] Other methods to accomplish the same end were published by other observers shortly after.

Chipault published on March 9, 1895, his method of wiring the spinous and transverse processes in Pott's Disease after "forcible correction" of the deformity under anæsthesia by manual traction on the head and extremities and pressure on the gibbosity.[8]

Calot published a paper on similar operations in 1896.[9]

Goldthwait reported, in 1898, his and Metzger's excellent method of hyperextension, without anæsthesia, in which the patient lies supine on two strips of steel, that portion of the spine above the knuckle being unsupported and gravity acting as the correcting force.[10]

Redard in the same year published his method of mechanical traction in a prone position with anæsthesia and manual pressure on the boss.[11]

In 1899 I presented to the American Orthopedic Association[12] my plaster jacket stool, supplemented with a pressure rod (Fig. 4), to control the point at which hyperextension was to be made (viz., at the kyphosis) and called the apparatus "The Kyphotone" (κυφὸς, hunchback, and τείνειν, to extend). I found that without pressure on the knuckle in mid-dorsal cases, the lordosis, or hyperextension, frequently was more marked in the lumbar region than in the region of disease and more marked than was desirable, but the pressure rod on the knuckle obviated this, making the region of the gibbosity the centre of this arc (Figs. 5, 6 and 7).

The comparative value of suspension and hyperextension in the correction of the deformity of Pott's Disease is well shown in the photographs (Figs. 8 and 9). In Fig. 8 (a double photographic exposure) the lower photograph shows the child sitting on the kyphotone and the knuckle is well seen against the background. The upper photograph shows the child suspended by the Sayre head-sling and the knuckle is virtually of the same size it was before traction was made. In Fig. 9 we see traction has been made on the head, the arms have been carried upwards and backwards, the pelvis has been made fast and the pressure-rod has been applied, causing hyperextension at the knuckle, with the result that the spine is virtually straight.

This year I wish to present two recumbent kyphotones which carry out the same mechanical principles of hyperextension.

The larger is similar in many details to the one attached to the office stool, but differs in having the patient lie in a supine position on a plate or pelvic crutch instead of sitting up. The main bar slides in a solid metal block and thus can be lengthened or shortened to adapt itself to the patient's size.

The pressure-rod, attachments for hands and head-sling are similar to the upright kyphotone (Figs. 10 and 11).

The smaller kyphotone is quite simple, inexpensive and can be easily taken apart and carried in a satchel to a patient's house. It consists of two solid bases and uprights, one surmounted by a plate of sufficient size to support the pelvis and the second by a small plate to press upwards against the knuckle. This latter plate is adjustable and can be raised or lowered to increase the pressure and vice versa. The distance between the uprights can also be regulated by a rod attached to the bases by set-screws. The plate of the pressure-rod is incorporated in the plaster jacket during its application, but can be easily slipped out after the patient is removed from the machine by making an incision on one side of the pressure-rod in the plaster, which at this stage has not entirely hardened (McKim's modification). Then the opening thus made can be entirely and easily closed by moulding together the moist edges (Figs. 12 and 13).

Both of these recumbent kyphotones have been made to meet the need of acute or early cases or those with external pachymeningitis with paraplegic symptoms, in which it is detrimental to even sit up momentarily until the head-sling is adjusted and the superincumbent weight removed.

I have made an additional use of the larger recumbent kyphotone, and had attachments made for the mechanical correction of scoliosis of a severe and advanced grade, and I have used it also as a twisting correction machine daily on such cases or to obtain a corrected position in which it is deemed advisable to hold the patient constantly by means of a plaster jacket. Lovett has of late shown the value of hyperextension in the treatment of scoliosis,[13] but the scope of this paper will not permit of further mention of this use of the recumbent kyphotone (Figs. 14, 15 and 16).

The question of which of these machines we shall use to prevent, correct or improve the deformity of Pott's Disease depends on the pathological condition we find the spine in, as shown by its flexibility, the size of the knuckle not necessarily being a determining factor of the latter.

(1) *Earliest Stages.*—At this period there is no deformity to correct, but the child will indicate by its posture, carriage or gait, grunting respiration, pain, night cries, muscular spasm or some of the characteristic symptoms, that spinal trouble is present. The region can be located by an expert and prevention of deformity obtained by plaster jackets applied in slight hyperextension on the small recumbent kyphotone.

[7] Hadra, Trans. Amer. Ortho. Assoc., vol. iv, 205.

[8] Chipault, Medicine Moderne, No. 20, Sixieme Année.

[9] Calot, Trans. Acad. Méd., Paris, 1896.

[10] Goldthwait, Trans. Amer. Ortho. Assoc., vol. ix, 1889.; Boston Med. and Surg. Jour., July 28, 1898.

[11] Redard, Archivio di Orthopedia, 1898, Fasc. 2.

[12] Transactions, vol. xii, and N. Y. Med. Jour., May 12, 1900, 716.

[13] Boston Med. and Surg. Jour., June 14, 1900.

At this stage caseation and conglomeration of the tubercles is beginning and traumatic contact from pressure of the healthy adjacent vertebræ is ripe to help break down the diseased vertebral body.

Unfortunately, the orthopedic surgeon rarely has an opportunity to try his skill at preventive medicine, as the general practitioner and general surgeon, for that matter, either retain the case themselves, using antiquated methods and recall hazily *one* lecture at college on "spinal disease," in which same "orthopedic lecture" nine times out of ten are given scoliosis, club-foot, flat-foot, bow-legs and all the rest, as well as "anteroposterior curvature." Or else the treatment (?) is referred to that paragon, the blacksmith —instrument-maker and pathologist.

(2) *Beginning Deformity.*—Thanks to the above treatment (?) or to the fact that the general practitioner *et al.* has been so busily engaged in diagnosticating the thoracic or abdominal pain he has failed to strip and roll the child over and look at its back, the knuckle is discovered by the child's mother. In such a case the vertebral body has partially broken down and abscess-formation has begun. Correction may be obtained by gravity with the small recumbent kyphotone and maintained by a plaster jacket.

(3) *More Advanced Cases.*—In a case in which several vertebral bodies have broken down, and in which some adhesions or fibrous ankylosis are ujst starting to form, either the large recumbent or upright kyphotone may be necessary to correct, with head-sling traction and pelvic fixation. It is at times astonishing to see a large hump disappear under this treatment (Figs. 8 and 9).

(4) *Neglected or Ankylosed Cases.*—If the ankylosis in a case is solid and condensing osteitis has taken place, *no extreme force is justifiable.* Pain should be the guide to the amount of pressure or traction force used. Even, however, in large knuckles or humps, it may be found the ankylosis is not solid, and it is certainly justifiable to lessen the deformity of such a case by one of the more powerful kyphotones and allow the spine to heal in an improved position.

The method suggested by Bradford and Vose[14] would seem also applicable to the first two of the foregoing varieties. This method consists of allowing the child to lie on its back and be slung in a position of hyperextension by a piece of firm cloth passing under the kyphos. This cloth, after passing around the side, is attached to a pulley, by means of which the hyperextension of the spine can be regulated.

When we consider the three regions of the spine to which hyperextension in Pott's Disease may be applied, we find difficulties confront us in each. In the cervical region with its normal lordosis the application of plaster of Paris bandages presents difficulties both as to efficiency, comfort and the avoidance of a bungling mass around the neck. A child's neck is so short, and with a traction head-sling on, it is next to impossible to apply an efficient bandage. The best plan is to use a steel back-brace with a head-support, but this will not correct the deformity. Instead of the head-support, or in conjunction with it, I have of late used a steel back-brace extending upward to or just above the kyphos and at this point had two buckles attached for a padded webbing strap to pass around the front of the throat. By tightening this strap the falling forward of the cervical segment can be limited or lessened, and it is astonishing how tight this strap can be borne. At first the patient gets quite livid in the face, but in a day or two the circulation adapts itself to the new condition and the child involuntarily holds the neck back, away from the strap, by means of the posterior muscles. I have seen no embarrassment of respiration and the superincumbent weight of the head is transferred to the healthy articular, transverse and spinous processes.

From the sixth (6) dorsal vertebra upward, our dependence must be placed on the steel back-brace with supplementary straps to hold the shoulders and neck well backwards. From this point downwards the plaster jacket can be used, applied in hyperextension, but owing to the normal kyphosis, extreme hyperextension is difficult and *entire* correction of a severe deformity is rarely possible, except in very early cases. In the lumbar region, where normal lordosis already exists, it is easy to overdo the hyperextension with the result that the patient has a pot-bellied or sway-backed appearance. This can be avoided by making the head traction upward and slightly forward (not upward and backward); or, by a modification one of my assistants, Compton Riely, has made, to exert pressure against the anterior superior spines in front and behind the trochanters major to prevent tilting forward of the pelvis, he having noticed in the majority of cases that the chief part of the lordosis was pelvic (Fig. 17).

Another method of obviating this excess of lordosis is to flex the thighs on the body, thereby relaxing the psoas pull on the lumbar spine and preventing the rotation forward of the pelvis.

I have not attempted the use of anæsthesia with these methods of applying correction to Pott's Disease, but rather avoided it as unnecessary and dangerous. The pain caused is inconsiderable in reduction and the resulting jacket is a relief to the painful symptoms previously present. These methods permit of the application of mechanically correct jackets, *i. e.*, those in which firm, even pressure is exerted against the three important points, the kyphos behind, the whole length of the sternum and ribs and the anterior spines of the ilia in front.

As I have said, in spines in which I suspect ankylosis I do not use great force, simply rendering them as straight as possible, *short of pain.* So-called "forcible correction," by which is meant manual traction and pressure under an anæsthetic, has but few adherents here in America, the majority of us feeling loath to tear by great force structures we could not appreciate on account of the anæsthetic, pain

[14] Annals of Surgery, 1899, vol. xvii, 223.

being eliminated. Fatal and untoward results have been reported by Sherman,[15] Jonnesco,[16] Lorenz[17] and others.

The tracings (Fig. 18) show the results in a few cases of the Hospital for Crippled Children. The stated duration of the disease is indicated under the initials of the case and it can be easily seen how much better results, as a rule, are obtained ultimately in cases treated early. On the other hand, when the size of the gibbosity is considered, quite an unexpected and appreciable improvement is shown in some of the cases.

As to the comparative value of the three machines, the upright kyphotone finds more general application than the other two, as in the stage in which the majority of cases present themselves the knuckle is somewhat advanced in formation and slight adhesions exist; further, the patient can be viewed from all sides and the ultimate appearance of the jacket is at all times apparent. It is the quickest method, all things considered.

For the early stages the small kyphotone acts admirably, and for cases with paraplegia or acute symptoms with an advanced kyphosis, the large recumbent khyphotone is needed.

For conclusions as to these methods of correcting the deformity of Pott's Disease and applying plaster jackets, I would say:

First. The jackets thus applied fix the spine in the most advantageous position for lessening the tendency for the production of deformity.

Second. The rapidity and ease with which jackets may be applied.

Third. These methods are applicable to mid- and lower-dorsal and lumbar caries. Above the sixth (6) dorsal, a steel back-brace with head-support or throat-strap must be used.

Fourth. It seems comfortable to the patient, as the thorax is well supported and the superincumbent weight is removed from the diseased vertebral bodies to the healthy articular processes. Quite an appreciable gain has been noticed in the nutrition of patients after this method is used, due largely to the increased lung-expansion, which the posture renders possible.

Fifth. Absolute immobilization of the patient in the desired corrected position is obtained, one person being able to apply the methods without assistants to steady the patients, as nothing can slip at the most important moment.

Sixth. Hyperextension has been used constantly in the Hospital for Crippled Children in applying jackets on all suitable cases, from 1895 to the present time, and its efficacy has been demonstrated to our satisfaction clinically.

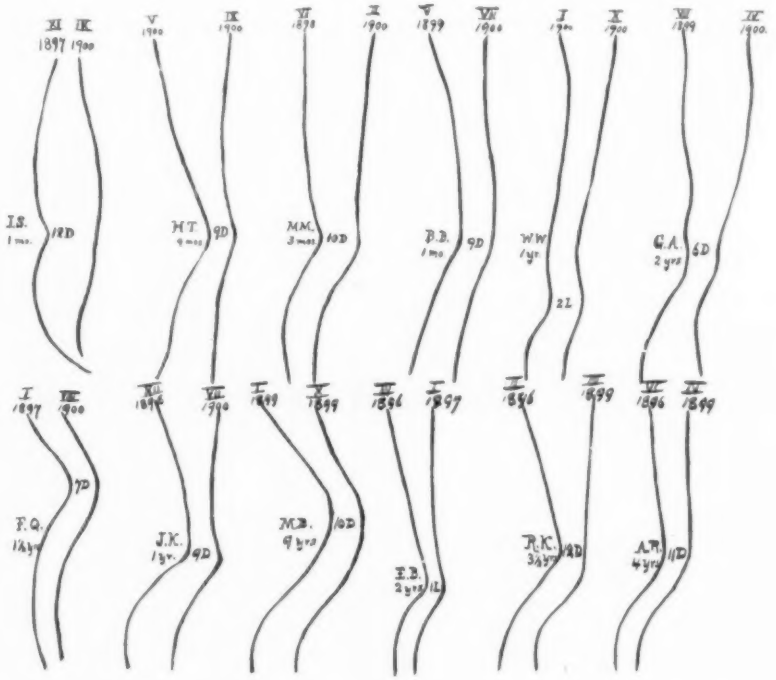


FIG. 18.—Tracings from (12) out-patients treated by kyphotones. Above each line is the date; to the left are the initials of the case and the duration when first seen. Between each pair of lines is given the vertebra chiefly involved.

[15] Pacific Record of Med. and Surg., October 15, 1898, 73.

[16] Communication to Twelfth Internat. Congress of Med.

[17] Deutsch med. Wochen., 1897, 556.

FIG. 1.—Spine. Lower Dorsal Region. Child. Vertical antero-posterior section. One intervertebral disk destroyed and the anterior adjacent edges of vertebral bodies softened and disintegrated. Extension of the process backward to dura, and forward among prevertebral ligaments. Moderate knuckle. (Nichols).

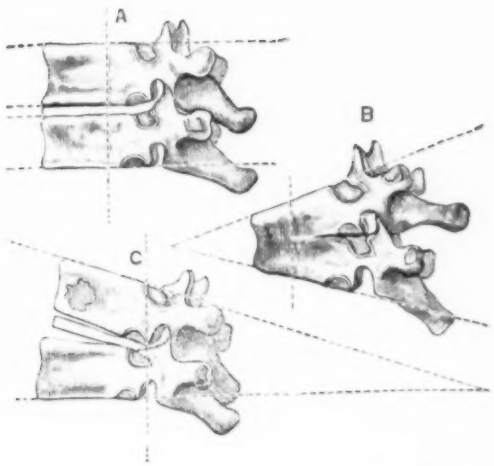


FIG. 2.—Diagram showing (A) Normal position of adjacent vertebræ. (B) Falling forward of the vertebral bodies in caries of the spine. (C) The aim of treatment of Pott's Disease by means of spinal extension in its true sense.

——— —— ——.—The planes of the vertebral bodies.

– – – – – – – – –.—The line of the centre of gravity and of the superincumbent weight.

FIG. 3.—The original plaster jacket stool. 1895.

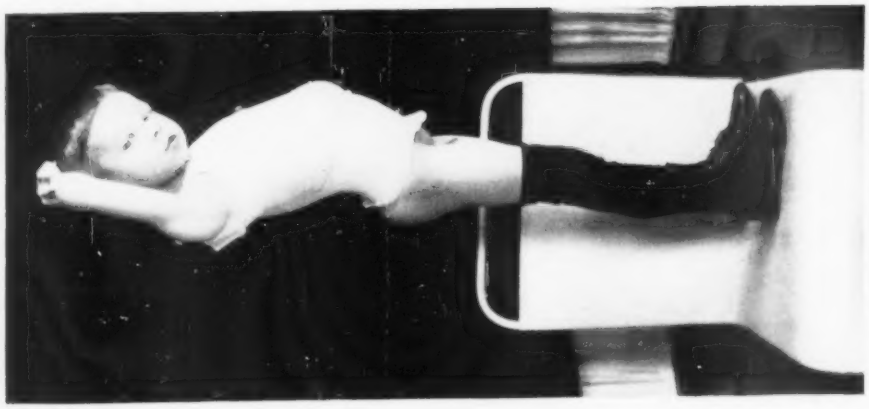

FIG. 7.—A patient (J. K.) showing the result of reduction.

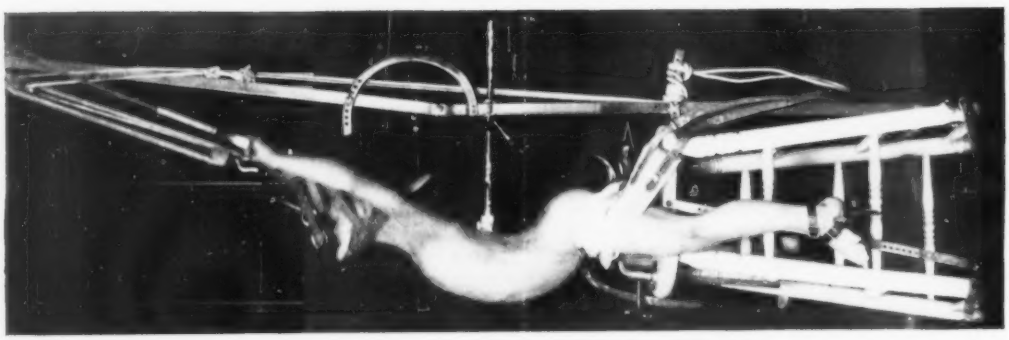

FIG. 6.—A patient (J. K.) on the kyphotone during the reduction of the kyphos.

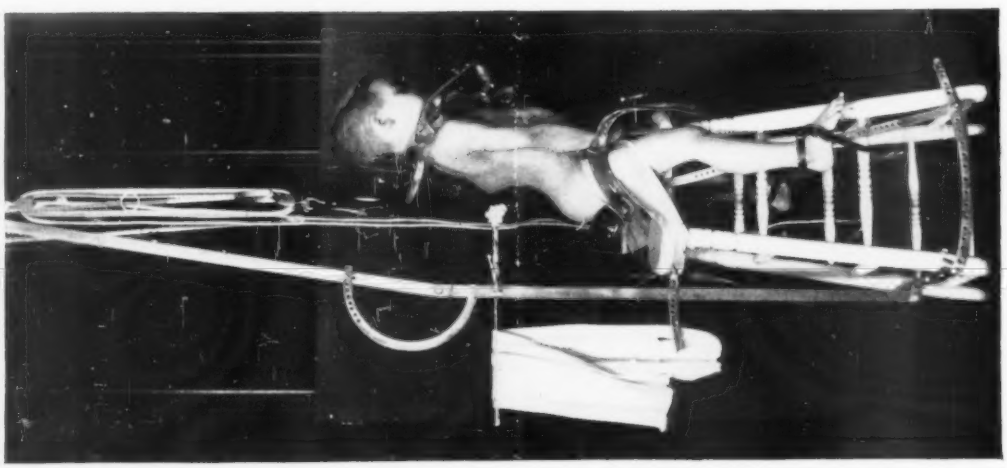

FIG. 5.—A patient (J. K.) on the kyphotone before reduction.

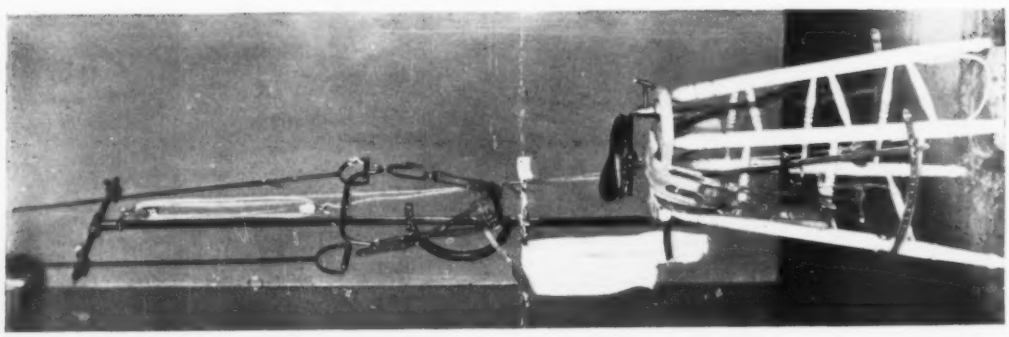

FIG. 4.—The kyphotone.

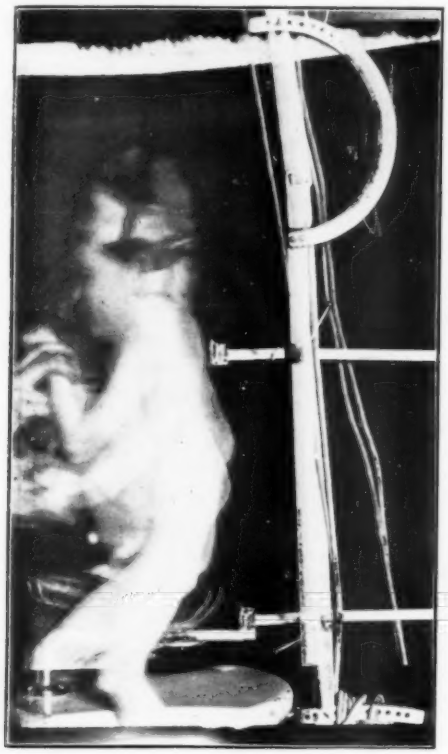

FIG. 8.—A double photographic exposure.
Lower figure shows child (H. T.) in sitting posture.
Upper figure shows child (H. T.) suspended by head, with no reduction in the kyphosis.

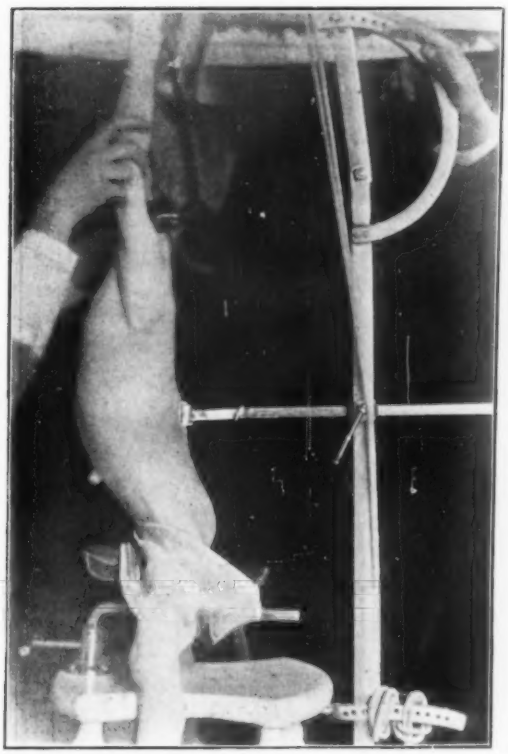

FIG. 9.—Shows child (H. T.) hyperextended with obliteration of the kyphosis.

FIG. 10.—Case (W. W.) showing deformity. Kyphotone seen on the right.

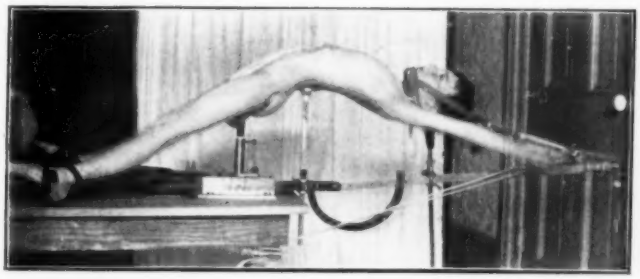

FIG. 11.—Case (W. W.) seen on the large recumbent kyphotone.

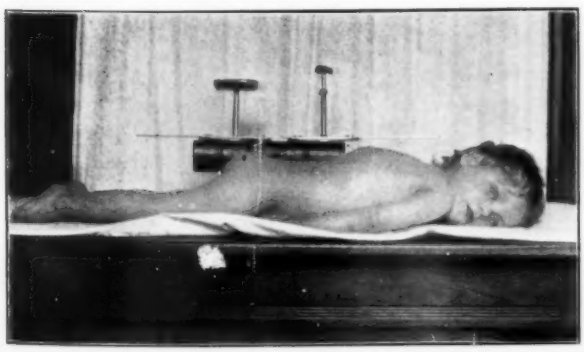

FIG. 12.—Case (B. B.) and small recumbent kyphotone.

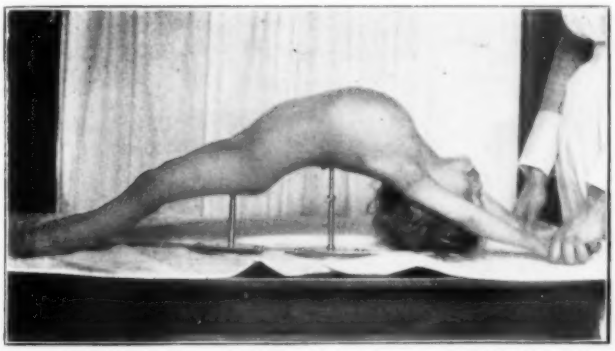

FIG. 13.—Case (B. B.) showing complete obliteration of the deformity.

FIG. 14.—Case (C. N.) scoliotic.

FIG. 16.—Case (C. N.) showing correction effected on large recumbent kyphotome and maintained by a plaster jacket.

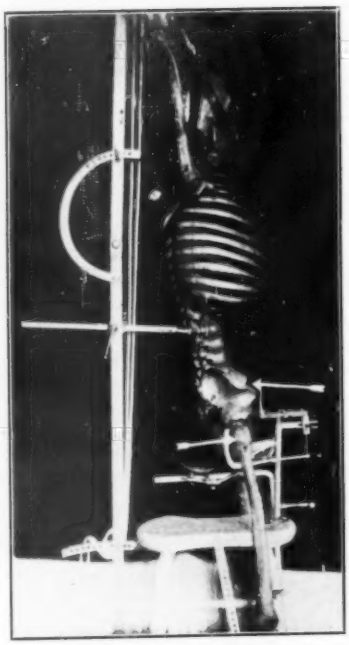

FIG. 17.—Compton Riely's modification, adjustable by set-screws to any pelvis. Arrows indicate points where pressure is made.

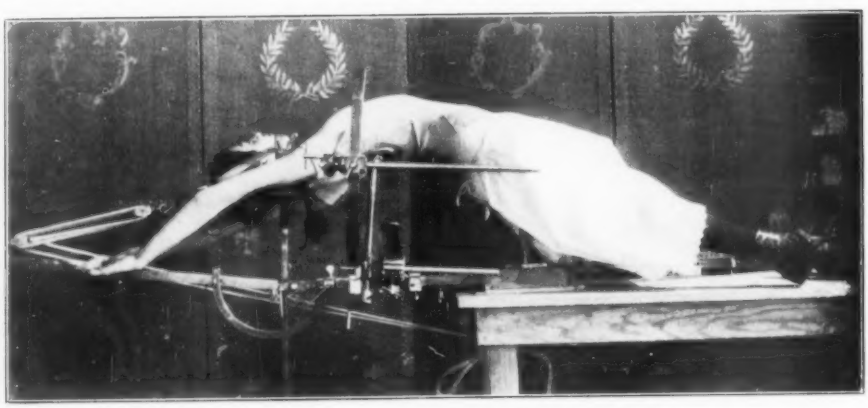

FIG. 15.—Case (C. N.) on large recumbent kyphotome.

Seventh. Aside from the danger of excessive and unequal force being used manually by *several* persons making traction for "forcible correction" under an anæsthetic, these methods enable *one* operator to adjust to a nicety his pressure and traction without an anæsthetic and further enable him to make his diagnosis as to the pathological stage the process has reached, which the size of the deformity does not always tell, in regard to the degree of ankylosis.

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# TWO EXAMPLES OF BENCE JONES' ALBUMOSURIA ASSOCIATED WITH MULTIPLE MYELOMA.[1]

A PRELIMINARY REPORT.

By Louis P. Hamburger, M. D.,

*Assistant in Medicine, Johns Hopkins University.*

On the 13th of last month, Dr. Iglehart brought me a specimen of urine with the remark that it contained an albuminous body having peculiar properties. It had been voided by one of his patients in large quantity—about 3,500 cc.—in the twenty-four hours. We examined it and found that it afforded the reactions which I shall demonstrate to you to-night.

[1] Demonstration before the Johns Hopkins Hospital Medical Society, November 5, 1900.

As you see, it is very pale, of an acid reaction, with a specific gravity of 1,004. It gives a white ring when floated over nitric acid. Heated to a temperature of about 55°, a heavy milk-white precipitate appears. Boiled, the fluid becomes clearer, only to become more turbid on cooling. The addition of acetic acid to the fluid after reaching its maximum turbidity causes it to become clear again. A few drops of nitric acid yield a precipitate which dissolves completely on boiling and reappears on cooling. In the Esbach albuminometer the proteid content reaches 0.27 per cent. The urine gives a strong biuret reaction. Let it be added that no casts were seen even in a centrifugalized specimen.

We recognized that this condition was no ordinary albuminuria. It is not the usual urine of nephritis, although the positive Heller's test alone might lead one astray. But the usual albumins of albuminuria, after being precipitated by heat, are not dissolved by the addition of a small quantity of acetic acid; they do not tend to redissolve on boiling; the nitric acid precipitate does not dissolve on boiling and reappear on cooling and the biuret reaction is wanting. The substances which do offer these reactions are the albumoses, the condition is that of albumosuria, and so I designate it in the present instance.

From an acquaintance with the literature on the subject, I was able to point out to Dr. Iglehart that this condition of so-called albumosuria in such a marked degree was an accompaniment of sarcomatosis of the bone, and, indeed, of a peculiar variety originating in the marrow and known as myelomata, new growths affecting for the most part the skeleton of the trunk—the vertebræ, the clavicles, the sternum and the ribs. Whereupon he recalled that his patient had had on two occasions most intense pain in the ribs and had lost much weight during the past three months.

So convinced was he by the data which were presented to him, that he gave a member of the family the serious prognosis which the condition merits.

Dr. Iglehart has given me further details of this peculiar illness. He was called to see the patient, a lady 49 years of age, in August, 1900. Previously healthy, she was suddenly seized at this time with sharp pain over the 9th left rib near its cartilaginous attachment. The pain was severe and increased on deep inspiration. There was tenderness on pressure over the painful point. Neither crepitus nor a friction rub was present. The condition so resembled a fracture that he considered the patient had injured the rib, but he could elicit no history of trauma. Within three weeks the pain had disappeared. She was again seen in September, this time complaining of nausea without apparent cause. Her general health had suffered; she had lost thirteen pounds in weight.

Early in October she was seized a second time with pain, now in the region of the 8th right rib in the mid-axillary line. It was at this time that the remarkable urinary condition was discovered. The patient herself had noted that since the past summer she had drunk more water than usual and had voided a larger quantity of urine.

Dr. Osler saw the patient on November 3d, two days ago, and aside from a slight pallor of the visible mucous membranes, the physical examination was negative.

In short, however absurd it may seem at first thought, from examinations of the urine I was confident I had established the probable diagnosis of new growth of the bone-marrow.

Excepting in diseases of the urinary tract itself, I know of only one other instance in which, without having seen the patient, the diseased organ may with great probability be determined from an examination of the urine. I refer to the presence of leucin and tyrosin in the urine as a sign of widespread destruction of liver substance.

Following the recognition of this example of albumosuria with its consequent diagnosis, Dr. Osler called my attention to the patient who lies before you, and it is to his courtesy that I am indebted for the privilege of reporting an abstract of her history.

The patient is a colored woman 50 years of age, who entered the medical clinic of the Johns Hopkins Hospital October 10, 1900, complaining of "rheumatism" and a "sprained hip." Regarding her family history she can only recall definitely that her father died of old age; that her mother, eight brothers and a sister have died from causes unknown to her; and that a sister is living and well.

She suffered the diseases of childhood and twenty-four years ago had "rheumatism" in both knees. Ten years ago she contracted grippe, and since then has had a cough each winter.

For about a year she has had pain in the region of the right groin and hip. One night last June, while picking up a bucket of coal, she experienced a remarkable sense of lengthening in the left arm and the next morning found that she could not raise it to her head because of pain and a feeling of weight. A week later the right arm became affected. She had pain here as well as in the shoulder, back of neck and chest. About this time the patient noticed a swelling the size of a hen's egg on the back of her head. Pain and stiffness in the arms continued so that by August she could neither cut her food nor feed herself. Six days before admission to the hospital, while walking, the right leg "gave away" without apparent cause. She fell to the ground, and since then has not been able to stand or walk. She has suffered great pain in the right hip. The patient has lost much weight and strength during her illness.

As you see, she is markedly emaciated. The mucous membranes are pale. Any movement of the body calls forth great pain. Over the occipital region there is a round, soft, fluctuating mass about 10 cm. in diameter, not adherent to the skin, not movable on the deeper tissues, not tender. A nodule three to four cm. in diameter is visible on either clavicle over its inner third. The one on the left is a little larger and more definitely circumscribed. It has evidently eroded the bone, for manipulation causes pain and crepitus. There is another tumor in the left supraspinous region about 4 cm. in diameter and evidently connected with the

acromion process of the scapula. The right lower limb is rotated outward and is abducted. The upper third of the thigh on this side is markedly enlarged and deformed by the presence of a tumor, about the size of a child's head, projecting from its postero-external aspect. It is firm and tender on pressure. An attempt to move the limb causes intense pain.

The lungs are clear on percussion. Here and there an occasional crackling râle is heard with inspiration. The point of the heart's maximum impulse is visible in the fourth left interspace 7 cm. from the midsternal line. A systolic murmur is audible at both the mitral and pulmonary areas. The abdomen is distended and held rigidly. No masses are to be felt. Neither the edge of the liver nor the spleen is palpable. There is no general glandular enlargement. The red blood-corpuscles number 3,548,000; the leucocytes, 4,500; hæmoglobin, 52 per cent. The relation of the different varieties of white corpuscles is practically normal.

Now, here is a case in which the clinical picture is clearly one of sarcomatosis of the bone. Does the urine exhibit the characteristics of albumosuria? As a matter of fact it does.

The urine is turbid, light yellow, and 600 to 800 cc. are voided daily. It is usually alkaline, though at times neutral in reaction. Its specific gravity varies from 1,012 to 1,030. Heller's reaction is positive. Acidified and heated to a temperature of 56° C., a heavy white precipitate appears. It redissolves in part on boiling and returns on cooling. The nitric acid precipitate disappears on boiling to reappear on cooling. The mixture assumes a darker color and particles of the precipitate adhering to the tube become pink. The biuret reaction is marked. The proteid content measured by the Esbach albuminometer varies from 0.3 to 0.6 per cent. Finally, Dr. Dorothy Reed has, by saturating the urine with ammonium sulphate and redissolving the precipitate, demonstrated more precisely the albuminose nature of this urinary constituent.

Some hyaline casts are present in the sediment.

This second case needs no peculiar explanation, but our diagnosis of neoplasm of the bone from examinations of the urine of Dr. Iglehart's patient needs justification.

The occurrence in the urine of proteids other than serum albumin is an old observation. Almost thirty-five years ago Lehmann[1] made the statement that every albuminous urine contained in addition to serum albumin, serum globulin; in small quantity to be sure, but demonstrable. A little while later Gerhardt,[2] in an endeavor to distinguish between renal and febrile albuminuria, discovered in the urine a proteid substance which was not coagulated by boiling. It was present in small quantities in a variety of ailments, especially in those accompanied by high temperatures—diphtheria, typhoid and typhus fevers. Gerhardt designated the condition "latent albuminuria." Subsequent researches confirmed and extended these observations and established the close relation between the "latent albumin" of Gerhardt and peptone, the product of gastric digestion of albuminous substances. Peptonuria of slight degree was found to be an accompaniment of very many disorders: nephritis, suppurative processes, acute yellow atrophy of the liver, ulcerative diseases of the intestine, including typhoid fever and carcinoma of the bowel; it was described as occurring in scurvy. In short, so manifold were the conditions under which small quantities of peptones were found in the urine that conclusions of much practical value could not be drawn.[4]

With the well-known researches of Kühne and Chittenden[5] on gastric digestion, the subject of peptonuria entered a new phase. You will recall that they established the existence of a number of products intermediate between albumin properly speaking and peptones, namely, the albumoses. Differing among themselves in some details of solubility, they give certain of the reactions of the albumins and like them are precipitated by ammonium sulphate. Yet they partake of the nature of peptones, for they are not precipitated by boiling and they give the biuret reaction. In the light of Kühne and Chittenden's work, the conclusions concerning peptonuria had to be revised; probably all instances of "peptonuria" in the old sense are, as a matter of fact, examples of albumosuria. Using special methods for their recognition, albumoses have been found in small quantities in the urine of individuals suffering from various acute ailments; most constantly, perhaps, in pneumonia, purulent meningitis and empyema.

Now, this acute, transitory or slight albumosuria cannot be confused with the condition demonstrated to-night. In this second class the presence of a comparatively large amount of an albumose-like substance so alters the behavior of the urine toward the usual reagents that, as you have seen, the condition can be recognized without the employment of a relatively elaborate method. Moreover, in addition to the comparatively excessive degree, the albumosuria is persistent over long periods of time, not transitory.

The first recorded observation in this class was reported by Henry Bence Jones before the Royal Society of London in 1847.[6] He begins his communication thus: "On the first of November, 1845, I received from Dr. Watson the following note, with a test-tube, containing a thick, yellow semi-solid substance: The tube contains a urine of a very high specific gravity; when boiled it becomes highly opake, on the addition of nitric acid it effervesces, assumes a reddish hue, becomes quite clear, but, as it cools, assumes a consistence and appearance which you see: heat reliquefies it. What is it?" Bence Jones then proceeds to tell of his researches. The urine was voided by a grocer 45 years of age who had been "out of health" for thirteen months. The urine showed variations in its coagulability; as a rule it bore brisk and prolonged boiling without coagulating. With

[1] Virch. Arch., 1866, Bd. xxxvi, S. 125.

[2] Deut. Arch. f. Kl. Med., 1869, Bd. v. S. 215.

[4] See Senator, Ueber Peptonurie, Deut. Med. Wochenschr., 1895, Bd. 21, S. 217.

[5] Zeitschr. f. Biol., 1883, Bd. xix, S. 159, 209; 1884, Bd. xx, S. 11.

[6] Phil. Trans. Royal Soc., 1848, Pt. 1, p. 55.

copper sulphate and caustic potash, it gave a claret color. Most characteristic of all, Bence Jones thought, was its behavior toward nitric acid. This reagent gave a precipitate which dissolved on heating and reappeared on cooling. On January 2, 1846, he makes the note that the patient died, adding, "The following day I saw that the bony structure of the ribs was cut with the greatest ease and the bodies of the vertebræ were capable of being sliced off with a knife." . . . "The kidneys were sound both to the eye and microscope."

In 1850 Dr. Macintyre, who had attended the patient, published some details of his illness.[7] The man dated his ailment from a violent strain he had sustained in September, 1844, in vaulting out of an underground cavern. On coming to the ground he felt as if something "gave away" within his chest, with the further result that he suffered at the time agonizing pain. The pain gradually subsided, but about a month later he was again seized with sharp pain in the chest, this time without an apparent cause. In the following spring he had another severe paroxysm, the pain was referred to the right side between the ribs and the hip and was considered pleuritic in origin. These periods of intense suffering alternated with periods of marked amelioration. In time, however, every movement of the trunk was attended with excessive pain. The poor sufferer became anæmic and lost much weight and strength. Diarrhœa supervened, and finally, after a sixteen months' illness, the patient died exhausted. Physical examination failed to reveal the nature of this painful and fatal illness. The remarkable urinary reactions were noted two days before the specimen was sent to Bence Jones. Post mortem the condition was designated "Osteomalacia fragilis rubra." The substance of the sternum, ribs and vertebræ was rarefied and crumbling; their interior filled with a soft red gelatinous matter which microscopically consisted of "granular matter, oil globules, nucleated cells, constituting the bulk of the mass—a few caudate cells and blood-disks extravasated largely amongst the other cells, and giving the red color to the gelatiniform mass."

Bence Jones' observation was almost forgotten, when in 1883 Kühne[8] published the result of an examination of urine sent to him in 1869 with a clinical history by Stokvis, a Dutch clinician. In the specimen he rediscovered the reactions of Bence Jones and showed their close relation to those of his own digestive albumoses. The patient died after a nine months' illness which had been diagnosed as osteomalacia, but an autopsy was not held.

Several years elapsed and a third case was described from the clinical standpoint by Kahler and chemically by Huppert.[9] A physician was the patient, the clinical diagnosis was osteomalacia; the urine afforded Bence Jones' reactions but post mortem instead of osteomalacia, a multiple round-cell sarcoma of the bone-marrow; in other words, a multiple myeloma was disclosed. Thereupon Kahler suggested that the presence of Bence Jones' reactions might be of service in the diagnosis of multiple myeloma. Might not the other two cases of so-called osteomalacia with albumosuria have been instances of this disease? Bence Jones had recognized that the association of the unusual urinary reactions and the disease of the bone was probably not a fortuitous one, for at the conclusion of his communication he writes: "This substance must again be looked for in acute cases of mollities ossium." But it is Kahler who first identified the pathological condition in these cases of bone disease and albumosuria with the affection previously described by v. Rustizky[10] and called by him "Multiples Myelom." The Italians give Kahler due credit, for Bozzolo's case is presented under the caption "Sulla malattia di Kahler."[11] By the accumulation of recorded cases, Kahler's surmise has become a fact.

To be brief, let me say that in the fifty years following Bence Jones' presentation of his case before the Royal Society, there were published and available for criticism only four observations on albumosuria associated with primary bone disease. Within the last three years, however, eight additional cases have been recorded. In eight of the thirteen cases the autopsy has disclosed neoplasms which must be classified as myelomata. In two cases the tumors were visible, in the remainder there was no record of a post-mortem inspection.[12]

In this series are not included two examples of Bence Jones' albumosuria which seem to be exceptions to the general rule, since in one there was no ground (albumosuria excepted) for assuming a disease of the bone, while in the other there were, to be sure, changes in the bone-marrow, but their identity with those found in myeloma could not be satisfactorily established.

The first case is described by Dr. Fitz[13] as one of myxœdema in which marked and persistent albumosuria was a feature. The patient died while under thyroid therapy. Inasmuch as no autopsy was held, the case is not above criticism. It is in the course of this publication that brief reference is made to the only recorded American observation on multiple myeloma and albumosuria.

Askanazy's case of lymphatic leukæmia[14] constitutes the second apparent exception.

His patient was a man fifty-one years of age, who was ad-

[7] Med. Chir. Trans., London, 1850, vol. 33, p. 211.

[8] Loc. cit.

[9] Prag. Med. Wochenschr., 1889, Bd. 14, S. 33.

[10] Deut. Zeitschr. f. Chir., 1873, Bd. 3, S. 162.

[11] VIII Congresso di medicina interna, 1897, (Transactions).

[12] The cases reported are those of Bence Jones, loc. cit.; Kühne and Stokvis, loc. cit.; Kahler, loc. cit.; Stokvis, quoted by Rosin; Seegelken, Deut. Arch. f. Kl. Med., 1897, Bd. 58, S. 126; Rosin, Berl. Kl. Wochenschr., 1897, Bd. 34, S. 1044; Bozzolo, loc. cit.; Ewald, Wien. Kl. Wochenschr., 1897, S. 169; Bradshaw, Med. Chir. Trans., London, 1899, p. 251; Fitz, Amer. Jour. Med. Sc., 1898, vol. 116, p. 30; Naunyn, Deut. Med. Wochenschr., 1898, Vereins Beilage, S. 217; Ellinger, Deut. Arch. f. Kl. Med., 1899, Bd. 62, S. 255; Sternberg, Nothnagel's Spec. Path. u. Ther., 1899, Bd. vii, Th. ii, Abth. ii, S. 57.

[13] Loc. cit.

[14] Deut. Arch. f. Kl. Med., 1900, Bd. 68, S. 34.

mitted to the hospital in June, 1898. In the summer of 1897 he began to complain of feeling weak; he lost weight and was easily fatigued. Six months later he noted that the cervical glands were enlarging. On admission he was somewhat anæmic; the legs and the abdominal wall were œdematous. There was a moderate enlargement of the lymph glands of the neck and axillæ; several small subcutaneous glands were palpable over the chest wall. A glandular tumor about the size of a man's head occupied the right upper quadrant of the abdomen. Small tumors were felt in Douglas's fossa. The blood showed the changes of lymphatic leukæmia. The urine exhibited Bence Jones' albumosuria. Five weeks later the patient died, and acute pulmonary œdema being the immediate cause of death. At the autopsy the ribs were found very thin; four of them were fractured presumably in transporting the cadaver. A thick, gelatinous marrow, the color of meat, occupied the wide meshes of the bony structure. Microscopically, this marrow was composed of colorless elements, among which the lymphoid cells predominated. There was a hyperplasia of all the lymphatic glands.

Unless the process is to be viewed as a diffuse myeloma, here is an exception. Until the relations of the myelomata to leukæmic and pseudo-leukæmic processes are determined, Askanazy's case must be considered one of lymphatic leukæmia associated with Bence Jones' albumosuria. But this single possible exception need not vitiate the importance of albumosuria as a sign of bone-marrow tumors, seeing that in all other instances where the investigation has been thorough, a multiple myeloma has been the underlying condition.

To demonstrate the converse proposition that all cases of multiple myeloma are accompanied by Bence Jones' albumosuria is not possible, the data being insufficient. Several considerations must be taken into account. The first is the difficulty in deciding just what a myeloma is; a difficulty to which I shall again refer. These urinary reactions seem to be specific for myeloma, not an accompaniment of every bone tumor. At the last German Congress for Internal Medicine Naunyn [15] stated that he had observed a patient whose skeleton was riddled with metastatic carcinomatous growths but the urine failed to give the reactions of Bence Jones.

Furthermore, it must be borne in mind that the time of the appearance of the reactions in the course of the disease has not been definitely determined. In the Stokvis-Kühne case the albumosuria appeared not until the illness was well advanced and disappeared three months before death. But this observation is exceptional; the albumosuria is, as a rule, an early sign and is persistent.

Quantitatively it is subject to great variations. In Ellinger's case the proteid content averaged from $\frac{1}{4}$ to $\frac{1}{2}$ per cent, while in the famous specimen submitted to Bence Jones, it reached the high percentage of six and nine-tenths. Even in the course of any single case there may be marked remissions in the intensity of the reaction, a fact noted by Matthes [16] and likewise observed in the second case of our series.

It must be shown, then, that the diagnosis of the nature of the bone tumor has been well founded and that repeated urinary examinations have been made before one can accept v. Jaksch's statement that he has observed cases of multiple myeloma in which there was not a trace of albumose in the urine.[18]

The exact nature of the substance giving rise to the reactions of Bence Jones has not been determined. All investigators have noted the close relation existing between these reactions and those of the albumoses in Kühne's sense, and yet when isolated it differs in minor features from any of the known digestive proteoses. Recently before the German Congress just referred to, Magnus-Levy [17] denied its albumose character. He stated that he had isolated Bence Jones' proteid in crystalline form; that its property of being dissolved at the boiling-point was not constant; that by the addition of small quantities of salts or extractives such as urea or by slight alterations in the physical conditions its solubility or insolubility at a temperature of 100 degrees could be brought about at will. Moreover, he argued, its structure must be more complex than the albumoses, for as a result of its peptic digestion almost all of the primary split products, namely, the albumoses, were obtained.

The origin of the proteid is as obscure as its character. Ellinger's attempt to extract it from the marrow tumors was not successful. But his demonstration of its presence in the blood is fairly satisfactory. On the other hand, in his case of lymphatic leukæmia Askanazy could not demonstrate the reactions in the blood, yet was successful in finding the proteid in an extract of the bone-marrow. You will see that these are obscure problems requiring further research.

Aside from the reactions to which I have so often referred, there are no constant alterations in the urine. Kahler's patient voided 2,230 cc. in 24 hours, but he was accustomed to drink large quantities of alkaline water. Otherwise there is no reference to a polyuria comparable to that exhibited by Dr. Iglehart's patient.

Bradshaw's patient voided a milky urine from time to time for a year previous to the onset of any localizing symptoms.

Besides the peculiar albuminose proteid the urine usually contains albumin in traces. In Senator's case [18] there was a coexisting nephritis manifesting itself by the presence in the urine of numerous casts and albumin. At the autopsy the kidneys were large and had suffered fatty and amyloid degenerations. Needless to add that a myeloma was also disclosed.

I pass now to a more accurate description of the nature of myelomata. Multiple new growths of the bone-marrow, they do not correspond to the usual conception of malignant

[15] Verhand. d. Cong. f. inn. Med., 1900, S. 496, et. seq.

[16] Loc. cit. [17] Loc. cit.

[18] See Rosin, loc. cit.

neoplasms in the Cohnheim sense, inasmuch as they probably never metastasize.

The name "multiple myeloma" originated with v. Rustizky,[18] who viewed the process as a simple hypertrophy of the bone-marrow, and for these reasons: the tumors were present only in the bones and, indeed, originated only in the bone-marrow, that although multiple, they did not metastasize; therefore, did not belong to the class of malignant neoplasms. Since v. Rustizky's publication there have been several attempts to gather together the scattered records of apparently similar growths.[20] Thus there have been collected examples of diseases of the bone with most diverse titles – osteomalacia, medullary pseudo-leukæmia, sarcomatous osteitis, malignant osteomyelitis, lymphosarcoma. Histologically in the majority of instances the structure has been that of a round-cell sarcoma. Recently, Wright[21] has described a myeloma in detail in connection with Fitz's case. The tumor elements, according to his research, really form a variety of plasma cells. A myeloma does not originate in the marrow cells as a whole, but in only one of its elements, the plasma cell. Following the results of this important contribution, the tumor may be classed as a plasmoma.

In gross, these tumors form masses of soft reddish tissue of various sizes, often ill-defined, replacing the normal marrow and osseous substance. The sternum, ribs, vertebræ and skull are prone to the affection though all the bone may be involved. The tumors may or may not appear on the exterior. The bones are softened and apt to suffer pathological fractures with resulting deformities. These facts of pathological anatomy explain in part the varying clinical pictures of multiple myeloma.

A disease of later life, it affects males more frequently and runs its course as a rule within two years. Bozzolo's patient lived four years after the onset of the first symptoms, while the physician under Kahler's care suffered eight years before death relieved him. The recital of this history makes a harrowing tale, but as it serves to illustrate one type of the disease I shall present it in some detail:

Dr. Loos was in 1879 a well-developed man, 46 years of age, of healthy appearance. In July of that year he was suddenly seized with severe pain in the upper half of the chest on the right side. A brother physician examined him but could not detect any abnormality. In the course of a week he felt entirely well. The following December, suddenly and without apparent cause, he had another similar attack of intense pain. This time, however, it was distinctly localized in an exquisitely tender area over the third right rib in front. But just as before, the pain soon disappeared. The urine at this period presented no abnormal change.

During the year 1880 paroxysms of intense pain, referred to numerous ribs and other parts of the trunk as well as to the right patella, alternated with periods of comfort, during which he could attend to his busy practice. Any unusual muscular exertion, however, would call forth violent pain.

In March, 1881, following a slight contusion, an exceedingly painful and tender area appeared over the fifth left rib. A flat elevation could be outlined over the costal surface, but in the course of a few weeks both pain and elevation had disappeared only to recur later in other ribs and bones. During the latter part of this year and for the first time, the urine gave a heavy precipitate with nitric acid. The patient had lost considerable weight and looked ill.

The early months of 1882 were passed in much the usual way. When confined to bed by the unbearable bone pain and neuralgias his condition was truly pitiful. Every movement aggravated and intensified his great suffering. Besides, his nights were sleepless and paroxysms of tachycardia and cardiac oppression added to his discomfort. The summer of this year saw an improvement so that he was able to resume to some extent his favorite pastime, hunting. But the improvement was temporary, for before the year closed the painful attacks returned, the anginal paroxysms were renewed and in addition he was troubled with nausea.

The poor doctor's suffering continued during the following two years, 1883 and 1884. What with the pain in the ribs and sternum, the anginal attacks and nausea, paresthesias in the lower limbs, visceral pains and obstinate insomnia, his state had become deplorable.

In 1885 a kyphotic bowing of the upper thoracic vertebral column was noted. In December of this year Kahler saw him for the first time. He was then cachectic; his spinal column presented a dorsal kyphosis. Standing, his face pointed down; the trunk appeared markedly shortened compared with the length of the extremities. There was marked tenderness on palpating certain circumscribed areas over the body of the sternum and the ribs. Careful and repeated examinations of these regions disclosed very slight elevations of the bony surfaces. The urine exhibited the reactions of albumosuria.

The doctor's condition grew progressively worse in 1886. Pain recurred in various bones of the trunk and neuralgias in the nerves of the extremities. The kyphosis increased, the thorax became deformed, the sternum projecting forward and the ribs appearing correspondingly bent. In 1887 the inguinal glands were found enlarged. The sense of hearing had been diminishing for several years, but now its impairment was very marked. A double labyrinthine affection was diagnosed. In April of this year a well-marked crepitus could be elicited over the third right rib by pressure and by the respiratory movements. A tumor appeared in the right supraspinous region.

Finally, deformed, deaf and suffering, the patient was released by death in August, 1887.

I have spoken of the clinical diagnosis in the case as well as the anatomical examination. The essential features of this type of the disease are the paroxysms of pain referred

[18] Loc. cit.

[20] See Hammer, Virch. Arch., 137, S. 200.

[21] Contributions to the Science of Med. dedicated to Dr. W. H. Welch. The Johns Hopkins Press, Baltimore, 1900.

to the bones, the great deformity of the skeleton of the trunk, the cachexia and the presence of Bence Jones' albumosuria. These are the cases that have been mistaken for osteomalacia, but in no example of true osteomalacia have these urinary reactions been discovered, so that the albumosuria suffices for differentiation.[22]

The patient shown you to-night illustrates a second class. Here the tumors are visible and there are pathological fractures. In Bozzolo's patient the tumors appeared on the arms, shoulders and ribs. A diagnostic difficulty arises in deciding whether these tumors are metastases of a primary growth latent in some distant organ or multiple primary tumors of the bone. The albumosuria not only answers this question but at the same time determines the nature of the new growth. In no instance of multiple metastatic osseous tumors have Bence Jones' reactions been present and the new growth has invariably been a myelogenous sarcoma, a myeloma.

In a third division must be placed the cases of multiple myeloma in which the bone symptoms and signs are vague or even absent. To this class belongs the case of Ellinger:

His patient was a man 45 years of age who was admitted to Lichtheim's clinic in October, 1897. For about six weeks he had had, almost daily, chilly sensations, fever and sweats. His appetite failed and he felt ill. He did not complain of pain in any part of the body.

The man was fairly well nourished and presented slight jaundice and fever. The urine contained some albumin and biliary pigments. The jaundice diminished but the fever persisted; the patient grew weaker and paler. Four weeks after admission Bence Jones' reactions were discovered in the urine. Two weeks later the clinical picture was clearly one of progressive anæmia with hemorrhagic sputum and effusions into the subcutaneous tissue, the joints and serous cavities. In a few days this condition led to the exitus lethalis. Just before death it was noted that percussion over the sternum was painful. No diagnosis was made. Post mortem, a multiple myeloma was discovered.

In cases such as Ellinger's the progressive anæmia and its concomitants occupy the attention of the observer, and, unless the significance of the albumosuria is recognized, a diagnosis is impossible.

A transition from this class of multiple myeloma to those in which the bone lesions are evident is illustrated by Dr. Iglehart's patient. Macintyre's case, which formed the basis of Bence Jones' observations, belongs to this variety of myeloma. Macintyre wrote that "the affection to which it bore the nearest resemblance was a severe attack of lumbago or sciatica." But he adds it was evident "that suffering so intense must have a deeper seat and more formidable cause than mere muscular or neuralgic rheumatism." In discussing the diagnosis of maladies of the bone, he remarks that their nature is usually not suspected until they are fully developed and until deformities or fractures are present. He adds very wisely: "It is this consideration that, in my mind, invests the properties of the urine, voided by this patient, with their chiefest interest."

In relating the clinical histories of multiple myelomata, I have mentioned several of the anomalous symptoms—fever, nausea, attacks of visceral pain, neuralgias and paresthesias.

The remarkable nervous symptoms have been considered in detail by Senator.[23] His patient presented a double hypoglossal paralysis, anæsthesia in the region supplied by the third division of the trigeminal nerve and a paresis of the arytenoideus. These curious phenomena so dominated the clinical aspect of the case that in spite of the presence of albumosuria a diagnosis was not reached. The autopsy disclosed myelomata, but no appreciable change in the nervous system was found. Senator regards the anæmia in such cases as the etiological factor, basing his opinion on the researches which have demonstrated that not only slight functional disturbances in the nervous system but even gross alterations in its structure may occur in the course of a profound anæmia.

I have attempted to show you how manifold is the symptomatology of multiple myeloma. You may readily imagine the obscurity of the cases in which the osseous system presents no localizing symptoms.

It is as a contribution to the diagnosis of these obscure cases of a pernicious bone disease that I have presented this preliminary report and emphasized the importance of Bence Jones' albumosuria.

### Discussion.

Dr. Welch.—The most interesting recent contribution to the pathological anatomy of so-called multiple myelomata is the paper of Dr. James H. Wright, to which Dr. Hamburger has referred. It seems clear that the lesions of the bones in this disease are not genuine tumors in the Cohnheim sense, and that the multiple nodules are not to be regarded as metastatic tumors secondary to a primary one. The growths in the bones have much in common with the infectious tumors. In the case reported clinically by Dr. Fitz and anatomically by Dr. Wright, the tumor-cells were predominantly plasma cells. It remains for future investigations to determine whether in all cases these multiple myelomata, which, as well known, have been described under a great variety of names, present the special histological characters so well described by Dr. Wright. If so, they would belong to the class of new growths, first designated by Unna as plasmomata. To this class belong many of the so-called infectious granulomata.

I have recently examined a small tumor of the palpebral conjunctiva sent to me for diagnosis and have found that the tumor is composed almost wholly of plasma cells, mixed with so few ordinary lymphoid cells that transitions between the latter and plasma cells are not easy to find. Probably some of the tumors which we formerly were accustomed to

[22] See Kahler, loc. cit.

[23] Berl. Kl. Wochenschr., 1899, Bd. 36, S. 161.

diagnose as lympho-sarcoma, round-celled sarcoma, etc., will be found to be plasmomata.

DR. ATKINSON.—Have these cases of albumosuria with bone lesions any connection with the cases of osteitis deformans reported some years ago by Paget and recently by Smith (Ergebnisse der Allgemeinen Pathologie und Pathologischen Anatomie des Menschen und der Thiere); the disease coming on insidiously with enlargement of the bones, gradual increase in the size of the head and shortening of the body through degeneration of the bones and bowing of the legs? In a certain number of those cases of osteoporosis and osteosclerosis the end has been cancer of the bones, and I suspect albumosuria might have been found if looked for. I saw last spring an individual with typical osteitis deformans but he showed no lumps on the bones and no such reaction in the urine.

DR. HAMBURGER.—I know of no relation between the two conditions and of no literature on the subject.

NOTE.—The colored woman died February 1, 1901. Post mortem, myelomata were found in the skull, left scapula, both clavicles, the sternum, the right ilium and neck of the right femur.

Examination of Dr. Iglehart's patient now shows a slight but definite elevation over the ninth left rib in front.

# REPORT OF A CASE OF FULMINATING HEMORRHAGIC INFECTION DUE TO AN ORGANISM OF THE BACILLUS MUCOSUS CAPSULATUS GROUP.

BY GEORGE BLUMER, M. D., AND ARTHUR T. LAIRD, M. D.

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The subject of hemorrhagic infection in man, due to organisms of the Bacillus mucosus capsulatus group, has been so recently discussed in this country by Howard[1] that it seems hardly necessary to more than briefly review the subject in reporting a new case. The cases hitherto reported have varied from one another to a considerable degree in their intensity, and to a certain extent in the character of their lesions. Whilst in some cases the lesions were purely septicæmic and the infection of the cryptogenic type, in other instances the process seems to have started as a local infection, though quickly becoming generalized. Thus the cases of Bordoni-Uffreduzzi,[2] Von Dungern[3] and Kolb[4] were of the character of general infections without special points of origin, the cases of Tizzoni and Giovanni[5] seemingly originated from the skin, those of Babes[6] from the bronchi, and in our own case the intestinal tract was in all probability the primary seat of infection. In all instances the essential feature of the process was its hemorrhagic character.

The following case occurred in the practice of Dr. D. L. Kathan of Schenectady, to whom we are indebted for the history, and who kindly obtained permission for the autopsy. The case seems worthy of record on account of the relative rarity of this form of disease.

A. F., aged 20, a machinist.

*Family History.*—His father died of cancer of the kidney at 55. His mother died of pulmonary tuberculosis at 30. Two sisters are alive and well. There are none dead in the family.

*Past History.*—The patient has always been unusually strong and athletic. His habits are excellent.

*Present History.*—The patient had been in perfect health and working every day until October 19, 1900. On the morning of that day he went to work as usual after a hearty breakfast. He returned just after noon, not having eaten his dinner. He complained of feeling ill, and went directly to bed. He began to vomit and purge, the bowels moving every few minutes. He complained of pain in the abdomen. Examination showed that there was no local abdominal tenderness, no tympanites. The temperature was 103° F. The pulse was 120.

At the end of twelve hours he was seen again. At that time the bowels were only moving about once in four hours, and the vomiting had practically ceased. The temperature was subnormal. The hands and feet were cold and cyanosed. The face had a pinched appearance.

At the end of 24 hours there was confusion of mind, and the patient was in a state of complete collapse. Death occurred at the end of 36 hours, there having been at no time the slightest tendency towards recovery.

The autopsy was made six and a half hours after death in cool weather.

The following notes are abstracted from the protocol:

The body is 171 cm. long, powerfully built, and well nourished. Rigor mortis is well marked. There is extensive post-mortem lividity of the legs, arms and trunk. The surface is pale; there is no œdema. The lips and finger-tips are cyanotic. The mucous membranes are pale. The muscles are exceptionally well developed and normal looking. The peritoneal cavity is dry, both layers of the peritoneum being smooth. The omentum and appendix are normal.

The heart is in every way normal except for the presence of numerous subepicardial hemorrhages of small size, and slight cloudy swelling of the musculature.

[1] Howard: Journal of Experimental Medicine, vol. iv, No. 2, 1899.
[2] Bordoni-Uffreduzzi: Zeitschrift für Hygiene, 1888, Hft. iii.
[3] Von Dungern: Centralblatt für Bakteriologie, Bd. xiv, No. 17, 1893.
[4] Kolb: Arbeiten aus den Kaiserliche Gesundheitsamte, Bd. vii, 1891.
[5] Tizzoni and Giovanni: Ziegler's Beiträge, vi, p. 201, 1889.
[6] Babes: Archives de Médecine Expérimentale, tome v, 1890.

The lungs show numerous subpleural hemorrhages with congestion, and a few elevated, finely granular, deep-red areas, suggesting fresh broncho-pneumonia.

The spleen is much enlarged, measuring $16 \times 10.5 \times 5$ cm. On section it shows numerous hemorrhages into the pulp, and marked swelling of the Malpighian bodies.

The liver is enlarged, soft, and markedly cloudy.

The kidneys both present the same appearances, being much softer than normal, with their cortices pale and swollen. There are a few submucous hemorrhages beneath the mucous membrane of the pelves.

The adrenals, bladder, prostate and pancreas are normal.

The stomach shows a few submucous hemorrhages, but is otherwise normal.

The solitary follicles throughout the small intestine are markedly swollen, and in the ileum Peyer's patches are also affected. The mucosa of the intestine between the swollen lymphatic apparatus is congested and in places markedly hemorrhagic; in places the Peyer's patches contain discrete hemorrhages.

The large intestine is normal.

The mesenteric glands are swollen, some of them being pale, others hemorrhagic.

The brain and cord could not be examined.

### Microscopic Examination.

The heart-muscle shows nothing beyond an excessive number of polymorphonuclear leucocytes in the vessels.

The lung shows in places groups of alveoli containing red blood-corpuscles, with a few desquamated epithelial cells and an occasional dust cell. The blood-vessels in this organ also contain an excessive number of polymorphonuclear leucocytes.

The liver shows marked cloudy swelling of its cells, with occasional single-cell necroses. The portal vessels contain a great excess of leucocytes, which have wandered out in quite large numbers into the periportal connective tissue.

The spleen shows great dilatation of all its blood-spaces with blood. In the pulp spaces many large phagocytic cells containing red corpuscles are made out. There is no distinct evidence of proliferation of the endothelial cells lining the splenic vessels.

The kidneys show marked cloudy swelling of the parenchymatous cells. The capillaries, especially those of the glomeruli, are crowded with polymorphonuclear leucocytes. Two distinct types of localized lesions are to be made out in these organs. In places in the cortex are localized collections of polymorphonuclear leucocytes invading the tubules and the intertubular connective tissue. In the medulla near its junction with the cortex are areas in which the intertubular connective tissue is quite œdematous-looking, and is infiltrated with a few polymorphonuclear leucocytes, and a moderate number of cells with round extracentral nuclei which have the staining reactions of plasma cells. These cells evidently come from the neighboring blood-vessels which contain many of them. No casts are seen in the tubules.

The changes in the intestines are partly inflammatory and partly proliferative in character. The inflammatory changes are most marked in the interglandular tissue and consist in an infiltration with polymorphonuclear leucocytes accompanied by hemorrhage. The proliferative changes are most marked in the lymphatic apparatus. They consist in the appearance of large cells of an endothelial type amongst the lymphoid cells which are greatly decreased in number. These large cells have distinct phagocytic properties and contain in places deeply stained particles of nuclear substance, presumably portions of lymphoid-cell nuclei. The blood-vessels in and near the lymphatic apparatus show proliferative changes in their endothelium. The proliferated cells almost block the capillaries in places, whilst in other places fibrin-formation with complete thrombosis has occurred. The changes resemble in every way those described by Mallory in typhoid fever, though less in degree.

The changes in the mesenteric lymph glands are essentially the same as those in the lymphatic apparatus of the intestine.

Sections of the various organs examined for microorganisms show short thick bacilli in the blood-vessels of the lung and in the areas containing exudate. They are also found in the sections of intestine and in the mesenteric glands. The organisms are, as a rule, free between the cells, but occasionally are found in large numbers in polymorphonuclear leucocytes. These organisms resemble those subsequently isolated from the mesenteric glands and the lung.

Cultures were made at the time of the autopsy from the heart's blood, lung, liver, spleen, bile and a mesenteric lymph gland.

All of these remained sterile after several days in the thermostat at C. 37°, except the culture from the lung, and that from the mesenteric gland. The tubes from each of these organs showed numerous colonies of a single organism which presented the following morphological and cultural characteristics. Unless otherwise stated, cultures were made on standardized media with an acidity of 1.5 according to Whipple's scale:

*Morphology.*—In young cultures grown at the temperature of the thermostat the organism appears as a bacillus, varying from 1 to 4 microns in length and averaging 0.5 micron in width. The organisms occur singly or in pairs or chains of 2 or 3 elements. The ends are rounded, many of the short forms appearing almost oval. Occasional thread-like forms are observed. Irregularly shaped forms, which stain unevenly, are seen in old potato cultures (6 days at C. 36-38°). The organism stains well with aqueous methylene blue (1:9), better with Löffler's methylene blue. Bipolar staining is sometimes noticed in the short forms. The organism is decolorized by Gram's method.

A capsule is to be made out by Welch's method in smears from animal tissues, and is occasionally seen in blood-serum cultures; it is not uniformly present.

No spore-formation is observed.

Flagella are not present, and the organism seems to be non-motile.

The organism grows best aërobically, but is also capable of growth under anaërobic conditions. It grows on media as follows:

*Agar Slant.*—After 24 hours there is a luxuriant, elevated, porcelain-white growth along the line of inoculation; the edge is finely serrated. There is abundant growth in the water of condensation. The growth is not markedly viscid. It has no odor.

*Agar Plates.*—The superficial colonies are circular, elevated, about 2 mm. in diameter with a sharply defined margin and a snow-white color. Under the low power they are made up of a coarsely granular periphery surrounding an opaque center. The deep colonies are spherical or lens-shaped, white, about 0.5 mm. in diameter, and microscopically finely granular in structure.

*Gelatin Plates.*—The surface colonies are small, not more than 1 mm. in diameter; they show little tendency to spread and are circular, elevated, white, and denser at the center than at the periphery. Under the low power they are yellowish, coarsely granular, and show a concentric arrangement and finely serrated edges. The deep colonies are spherical, opaque and finely granular.

*Gelatin Stab.*—There is a delicate growth along the line of the stab, and a slight circular non-elevated growth on the surface. No liquefaction is produced.

*Potato.*—After 24 hours there is a luxuriant, spreading, moist, elevated, brownish-yellow growth. The potato is discolored a brownish yellow. There is no gas production.

*Dunham.*—Is uniformly cloudy after 24 hours. No pellicle is formed. Later there is an abundant grayish-white sediment, which on agitation diffuses evenly through the liquid, and is not stringy.

*Blood-serum.*—The growth is similar to that on agar. There is no liquefaction of the medium.

*Indol-Formation.*—The organism produces indol in dextrose free bouillon after 4 days at C. 37°.

*Gas-Formation.*—Several different tests were made with each medium. Gas noted after 72 hours at C. 37°.

In 1 per cent glucose bouillon, 45-60 per cent of gas.

$CO^2\frac{1}{3}$

H $\frac{2}{3}$

In 1 per cent lactose bouillon, 45-55 per cent of gas.

$CO^2\frac{1}{4}$

H $\frac{3}{4}$

In 1 per cent saccharose bouillon, no gas is found as a rule. On one occasion a trace was noticed.

*Pathogenesis.*—25 minims of a 72-hour bouillon culture were injected subcutaneously into the abdominal wall of a full-grown guinea-pig. The animal died within 24 hours. The autopsy showed slight swelling at the point of inoculation, swelling of the nearest lymph glands with hemorrhages, an early serofibrinous peritonitis, and hemorrhages into the kidneys and beneath the pleura. The intestinal lymphatic apparatus was swollen and surrounded by congested mucous membrane. The organism was found in coverslips from the point of inoculation and the blood, at times encapsulated. It was recovered in pure culture from the seat of inoculation, blood and spleen.

25 minims of a 72-hour bouillon culture were inoculated into the peritoneal cavity of a full-grown guinea-pig. The animal died within 24 hours. The autopsy showed that there was no local or glandular reaction. There was a distinctly viscid seropurulent peritoneal exudate. The spleen was enlarged. There were hemorrhages into the adrenals and beneath the pleura. There was a fresh right-sided pleurisy. The organism was seen in the smears from the blood and peritoneal cavity, many of the organisms from the latter place having a distinct capsule. It was recovered in pure culture from the heart's blood, spleen and peritoneal exudate.

A full-grown rabbit was inoculated into the ear-vein with 25 minims of a 72-hour bouillon culture. It died within 20 hours. The autopsy showed no reaction at the point of inoculation. There was a fresh fibrinous peritonitis. The spleen was enlarged, soft and congested. The liver and kidneys were also congested, as was the mucous membrane of the uterus. The organism was recovered from the heart's blood, spleen and peritoneum in pure culture.

*Anatomical Diagnosis.*—Hemorrhagic infection due to an organism of the Bacillus mucosus capsulatus growth; acute hemorrhagic follicular enteritis; acute spleen tumor with swelling of the Malpighian bodies; cloudy swelling of the liver and heart muscle; acute infectious and interstitial nephritis; hypostatic congestion of the lungs.

We have placed the organism isolated in this case in the group of Bacillus mucosus capsulatus, since whilst it differs in minor points from similar organisms already described, it corresponds in the following features laid down by Fricke[1] for the identification of members of this group. Howard, quoting from Fricke, states as follows:

"The more important common characteristics of this group are the morphology, plump, medium-sized, plemorphic rods; the presence of capsules, readily demonstrable in the animal body and sometimes in cultures; lack of motility and of spores; failure as a rule to stain by Gram; the rapid, luxuriant, elevated, viscid white growth upon the surface of solid media; absence of liquefaction of gelatin; and pathogenicity, usually in the form of septicæmia, but with striking variations for different animals, and for different members of the group."

In comparing this organism with a culture of Howard's bacillus of hemorrhagic septicæmia which he kindly sent us, and with a culture of Pfeiffer's capsulated bacillus, which we obtained from the Laboratory of Hygiene of the University of Pennsylvania, the growth of the three organisms on ordinary media was almost identical. Our organism, however, failed to produce gas in saccharose bouillon, and

[1] Fricke: Zeitschrift für Hygiene, Bd. xxiii, 1896.

produced indol constantly. Both Pfeiffer's and Howard's organisms produced abundant gas in saccharose bouillon. We were never able to detect indol in cultures of Pfeiffer's organism, though in one out of several cultures of Howard's bacillus we obtained a faint indol reaction. Pfeiffer's organism was furthermore distinguished by the fact that on solid culture media the growth constantly exhibited a mucilaginous consistency so that it adhered to the needle and pulled out into threads. In its failure to produce gas in saccharose bouillon our organism seems to differ from all of the so far recorded ones. The various organisms of this group studied by Strong[8] all produced gas in saccharose, as did the organisms recently studied by Howard.[9]

The case is of interest pathologically on account of the proliferative changes in the lymphatic apparatus of the intestine, and clinically on account of its exceedingly rapid course.

[8] Strong: Journal of the Boston Society of the Medical Sciences, vol. iii, 1899.

[9] Howard: Journal of Experimental Medicine, vol. v, no. 2, 1900.

## INTRODUCTORY NOTE TO DRS. DURHAM AND MYERS'S REPORT.

The following short summary was sent to me by Dr. Durham with the suggestion that it appear in a medical journal in this country. In justice both to the English Commission and to the American Commission, it should be stated that the comment in paragraph 11 is made without knowledge of the later fuller experiments and important results recently published by the latter commission.

Dr. Durham and Dr. Myers spent several days in Baltimore last July on their way to Pará, Brazil. All of us who met these gifted young investigators retain the pleasantest remembrance of them personally and were impressed with their fitness in scientific training and ability for the work which they were about to undertake. A little over a month ago came the sad news that Dr. Myers had succumbed to an attack of yellow fever. Dr. Durham, who contracted the disease at the same time, has fortunately recovered, and at the date of his writing (January 29) was about to resume the study of yellow fever.

The death of Dr. Myers at the outset of his career is a severe loss to medical science. His published contributions show thorough scientific training and marked originality, and, although extending over a period of only about three years, are valuable additions to knowledge, giving promise of much fruitful activity as an investigator. They relate mainly to problems of immunity, especially to immunity from snake-venom and from proteids.

Both Lazear of the American and Myers of the English Yellow Fever Commission have laid down their lives in the search for means of prevention, based upon better knowledge of the causation, of one of the most baffling and terrible scourges of mankind. How much more glorious is the cause to which these bright young lives were sacrificed than any for which nations are in arms to-day!

WILLIAM H. WELCH.

## ABSTRACT OF INTERIM REPORT ON YELLOW FEVER BY THE YELLOW FEVER COMMISSION OF THE LIVERPOOL SCHOOL OF TROPICAL MEDICINE.

BY HERBERT E. DURHAM AND THE LATE WALTER MYERS.

NOTE.—The completion of the interim report of which this is an abstract was interrupted by the onset of attacks of yellow fever in both of us. The loss of my much lamented colleague renders it advisable to submit this shortened report only for the time being.—H. E. D.

1. Sufficient search reveals the presence of a fine, small bacillus in the organs of all fatal cases of yellow fever. We have found it in each of the 14 cadavers examined for the purpose. In diameter the bacillus somewhat recalls that of the influenza bacillus; as seen in the tissues, it is about 4$\mu$ in length.

2. This bacillus has been found in kidney, in spleen, in mesenteric, portal and axillary[1] lymphatic glands taken from yellow-fever cadavers directly after death. In the contents of the lower intestine apparently the same bacillus is found often in extraordinary preponderance over other micro-organisms. Preparations of the pieces of "mucus," which are usually if not always present in yellow-fever stools, at times may present almost the appearance of "pure culture."

3. Preparations of the organs usually fail to show the presence of any other bacteria, whose absence is confirmed by the usual sterility of cultivation experiments.

4. It is probable that this same bacillus has been met with, but not recognized, by three other observers. Dr. Sternberg (Report on Etiology and Prevention of Yellow Fever, 1890) has mentioned it, and he has also recorded the finding of similar organisms in material derived from Drs. Domingos Freire and Carmona y Valle, but he did not recognize its presence frequently, probably on account of the employment of insufficiently stringent staining technique.

5. It is probable that recognition has not been previously accorded to this bacillus by reason of the difficulty with which it takes up stains (especially methylene blue), and by

[1] We find these constantly enlarged and much injected, though whether this is specific we are not able to say.

reason of the difficulty of establishing growths on artificial media.

6. The most successful staining reagent is carbolic fuchsin solution (Ziehl), diluted with 5 per cent phenol solution (to prevent accidental contamination during the long staining period); immersion for several hours, followed by differentiation in weak acetic acid. Two-hours staining period may fail to reveal bacilli, which appear after 12 to 18 hours. The bacilli in the stools are often of greater length than those in the tissues, and they may stain rather more easily; naturally the same is true of cultures. Some of our specimens have already faded.

7. Since the bacilli are small and comparatively few in numbers, they are difficult to find. To facilitate matters at our last two autopsies (14th and 15th), a method of sedimentation has been adopted. A considerable quantity of organ juice is emulsified with antiseptic solutions, minute precautions against contamination and for control being taken; the emulsion is shaken from time to time and allowed to settle. The method is successful and may form a ready means of preserving bacteria-containing material for future study. The best fluid for the purpose has yet to be worked out; hitherto normal saline with about $\frac{1}{5}$ per cent sublimate has been employed.

8. Pure growths of these bacilli are not obtained in ordinary aërobic and anaërobic culture tubes.

9. Some pure cultures have been obtained by placing whole mesenteric glands (cut out by means of the thermo-cautery) into broth under strict hydrogen atmosphere. Investigation into the necessary constitution of culture media for successful cultivation is in progress.

10. Much search was made for parasites of the nature of *protozoa*. We conclude that yellow fever is not due to this class of parasite. Our examinations were made on very fresh organ juices, blood, etc., taken at various stages of the disease, with and without centrifugalization,[2] and on specimens fixed and stained in appropriate ways. We may add that we have sometimes examined the organs in the fresh state under the microscope within half an hour after death.

11. The endeavor to prove a man-to-man transference of yellow fever by means of a particular kind of gnat by the recent American Commission is hardly intelligible for a bacillary disease. Moreover, it does not seem to be borne out by their experiments nor does it appear to satisfy certain endemiological conditions. It is proposed to deal more fully with the endemiology and epidemiology of the disease on a later occasion.

12. We think that the evidence in favor of the etiological importance of the fine small bacillus is stronger than any that has yet been adduced for any other pretended "yellow-fever germ." At the same time there is much further work to be done ere its final establishment can be claimed. The acquisition of a new bacterial intestinal inhabitant would explain the immunity of the "acclimatised."

Pará, Brazil, January 28, 1901.

[2] We have found this sometimes useful in examining the blood of ague patients.

## SUMMARIES OR TITLES OF PAPERS BY MEMBERS OF THE HOSPITAL AND MEDICAL SCHOOL STAFF APPEARING ELSEWHERE THAN IN THE BULLETIN.

IRVING P. LYON, M. D. Types of Normal and Morbid Blood.—*Park's Surgery by American Authors*, Second Edition, 1899.

Colored blood-plate showing types of normal and pathological blood, with description.

GUY L. HUNNER, M. D., and IRVING P. LYON, M. D. Mensuration and Capacity of the Female Bladder. Observations on the female bladder dilated by atmospheric pressure in the knee-breast posture.—*The Journal of the American Medical Association*, December 16, 1899.

(This article is not identical with the article of the same title which appeared in the BULLETIN in December, 1899. It is a longer and fuller article, from which the other was abridged.)

IRVING P. LYON, M. D. On Peculiar Condition of the Hair. —*The Journal of Tropical Medicine*, August, 1900. [On Plica Polonica.]

CHARLES CARY, M. D., and IRVING P. LYON, M. D. Primary Echinococcus Cysts of the Pleura. Report of a case of primary exogenous echinococcus cysts of the pleura, showing hyaline degeneration of the cuticle without lamellation, with notes from the literature.—*Transactions of the Association of American Physicians*, Washington, Vol. XV, 1900, and *American Journal of the Medical Sciences*, October, 1900.

IRVING P. LYON, M. D., and ALFRED B. WRIGHT, Stud. Med. An Inquiry into the Existence of Autochthonous Malaria in Buffalo and its Environs. Preliminary report on species of mosquitoes and blood-examinations.—*Buffalo Medical Journal*, November, 1900.

**THE JOHNS HOPKINS HOSPITAL BULLETIN.**

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## NOTES ON NEW BOOKS.

Disinfection and Disinfectants. A treatise upon the best known disinfectants, their use in the destruction of disease germs, with special instruction for their application in the commonly recognized infectious and contagious diseases. By H. M. BRACKEN, M. D., Minnesota State Board of Health. (*Chicago, Illinois: The Trade Periodical Company, 1900.*)

This little volume is most valuable. It is a manual containing careful and specific directions for the disinfection of clothing, rooms, patients, dead bodies and discharges from the bodies of the sick. It has a chapter with complete and varied information concerning the more common infectious diseases. Specific directions are also given for the proper isolation and care of smallpox, yellow-fever, tuberculous and other patients suffering from infectious diseases. There is no manual in English which contains similar practical information.

Fractures. By CARL BECK, M. D., Visiting Surgeon to St. Mark's Hospital and to the German Poliklinik—with 178 illustrations. (*Philadelphia: W. B. Saunders & Co., 1900.*)

In this volume of 335 pages the writer has attempted to deal with the general subject of fractures considered mainly from the standpoint of the Röntgen ray. In fact the volume is dedicated to Professor Röntgen. The introductory chapter deals with the general properties of the X-rays and their adaptability to certain varieties of fractures.

Part I deals with the classification, signs, diagnosis and treatment of fractures in general, with some special reference to the process of repair of fractures and disturbances in these processes. In connection with the subject of compound fractures the author discusses in some detail the general principles of aseptic surgical technique; a few pages are also devoted to the peculiarities of fractures in children.

Part II deals with fractures of special regions. Fractures of the shoulder and upper extremity are discussed in considerable detail, especial attention being devoted to fractures of the elbow joint and Colle's fracture. Fracture of the pelvis and lower extremity are also treated of in some detail. The writer especially advises the ambulatory treatment of fractures of the neck of the femur, the leg being immobilized by a plaster of Paris dressing extending from the foot to the pelvis.

A chapter is devoted to fractures of the bones of the trunk and another to fractures of the skull. In the latter the differential diagnosis of injuries to the head is considered and the technique of operation for fracture of the skull discussed.

The volume contains an appendix on the practical use of the Röntgen rays, in which the general principles of X-ray photography as well as the more desirable varieties of apparatus are considered. Considerable attention is devoted to the technique of X-ray photography.

The value of skiagraphy in the diagnosis of obscure lesions of certain organs and viscera is considered, especial attention being devoted to the diagnosis of biliary calculi. The appendix closes with a brief chapter on the errors of skiagraphy.

The volume is by no means an exhaustive discussion of the subject of fractures, and in matters of treatment leaves much to be desired.

The illustrations are numerous and are for the most part taken from skiagraphs, some of which are very good while others are decidedly unsatisfactory. There is in places a decided ambiguity as to the author's meaning, as for instance in discussing fractures of the diaphysis of the femur the following sentence occurs:

"Generally the lower fragment is rotated outward and pulled upward and to the inner and outer side of the upper one."

There is also an evident attempt throughout the volume to dispense with the time honored terminology of "ical" and to replace it with "ic." In this attempt there is, however, a most decided inconsistency, for in the same sentence the author uses in connection with the same noun the adjectives "chemic" and "mechanical," and in another place the adjectives anatomic and surgical are used in the same sentence.

The Treatment of Fractures. By CHARLES LOCKE SCUDDER, M. D., Surgeon to the Massachusetts General Hospital, Out-Patient Department, etc., assisted by FREDERIC J. COTTON, M. D. With 585 illustrations. (*Philadelphia: W. B. Saunders, 925 Walnut St., 1900.*)

A carefully prepared work upon a subject of such general interest and importance should be most cordially welcomed by the profession.

In this volume of 433 pages with 585 illustrations the author has treated the subject in a careful and systematic fashion. As he distinctly states in the preface, "the book is intended to serve as a guide to the practitioner and student in the treatment of fractures of bone." The work is by no means an exhaustive discussion of the subject, but rather a clear, concise statement of the most important facts connected with each particular fracture together with a careful description of at least one satisfactory method of treatment of each fracture. A great effort toward simplicity in the treatment of fractures is evident throughout the book.

Especially to be commended are the illustrations in which the work abounds, and these are for the most part of a high degree of excellence. The results of careful studies of fractures with the X-rays are incorporated in many of the illustrations and afford abundant evidence of the value of skiagraphy in this department of surgery.

Chapters 1, 2 and 3 deal with fractures of the skull and vertebræ, fractures of the inferior maxilla receiving especial attention.

Chapters 4, 5 and 6 are devoted to fractures of the ribs, sternum and pelvis, with a brief reference to the urinary complications of fracture of the pelvis.

The next two chapters are devoted to fractures of the scapula and clavicle, while in chapters 9, 10 and 11 fractures of the arm and hand are carefully discussed, the portions devoted to fractures of the neck of the humerus and Colle's fracture being especially satisfactory.

Four chapters are devoted to fractures of the leg and foot, and in them, as well as in other parts of the book, the author illustrates the results of the treatment of fractures of the different bones by statistics from the Massachusetts General Hospital. The use of a general anæsthetic as an aid in the diagnosis and proper reduction of fractures is strongly advised.

Thrombosis, embolism and sepsis as complications of fractures are briefly discussed.

In considering gaseous phlegmon as a complication of fractures, the author speaks of the bacillus of malignant œdema as the causative agent and does not mention the bacillus aërogenes capsulatus.

Especially to be encouraged is the introduction by the author of the terms "closed" and "open" to replace the terms "simple" and "compound" as applied to fractures.

A brief chapter is devoted to the anatomy of the epiphyses and their importance in fractures.

A chapter written by Dr. Colman treats of the value of the X-rays in the diagnosis of fractures and briefly discusses the sources of error and the dangers associated with the use of the X-rays.

A short chapter is devoted to the employment of plaster of Paris in the treatment of fractures and methods of preparation of plaster of Paris dressings are described.

The book closes with a chapter on the ambulatory treatment of fractures with a brief description of the methods to be employed and the results that have been obtained.

Altogether this book shows great care and thought in its preparation, fulfils a decided need, and is one which can be recommended to both the student and the practitioner; it should receive the hearty endorsement of the profession.

A Text-Book of Pathology. By ALFRED STENGEL, M. D. Third edition. Revised. (*Philadelphia: W. B. Saunders & Co., 1900.*)

In this edition the author holds to his original purpose of supplying the clinician with a concise book on pathology, and he has briefly outlined the main points of general and special pathology within the limits of a text-book of moderate size. On account of the condensation necessary in a work of this kind, the book is hardly one that would be suitable for those beginning the study of pathology. It is a store-house of facts which are necessarily stated boldly and dogmatically. A greater diffuseness and amplitude of statement would add much to its value for the use of students. The volume is abundantly illustrated, and contains a full index which adds much to its value as a book for ready reference.

A Manual of the Diagnosis and Treatment of the Diseases of the Eye. By EDWARD JACKSON, A. M., M. D., Emeritus Professor of Diseases of the Eye in the Philadelphia Polyclinic, with 178 illustrations and 2 colored plates. (*Philadelphia: W. B. Saunders, 1900.*)

The book is all that it purports to be—a manual for students of ophthalmology and for the general practitioner of medicine—and we believe it serves its purpose admirably. It seems particularly well adapted to the wants of medical students, containing, as it does, such a distinct, clear-cut, conservative and concise exposition of ophthalmologic subjects. The bibliographic appendix to each chapter, giving references to the best articles published on the subject discussed therein, is a decidedly valuable feature of the book. It broadens the scope of the work very considerably without interfering much with its brevity.

To review each chapter in detail is unnecessary, indeed, the well known reputation of the author is sufficient guarantee of the character of the book and we heartily commend it to both students and physicians.

H. O. R.

Panama and the Sierras: A Doctor's Wander Days. By G. FRANK LYDSTON, M. D. Illustrated from the author's original photographs. (*Chicago: The Riverton Press, 1900.*)

This little book of nearly 300 pages is written in an easy, readable style, and contains much of special interest to the physician, although not in any sense a medical book. The writer has an excellent ability to describe what he sees, and he sees almost everything which passes about him. In some instances he is flippant, but he is always interesting. The book contains an account of a journey for health made to California by way of the Isthmus of Panama and the experiences of the writer upon the Isthmus, in Mexico, and also in California.

Dr. Lydston is a native of California, and in revisiting the State he renewed his acquaintance with many towns in the mining region with which he was familiar as a boy. The account which he gives of the exhausted mines and deserted mining settlements is most interesting. The illustrations are good, but some of them should have been spared a sensitive and susceptible reader.

Rhinology, Laryngology and Otology, and their Significance in General Medicine. By E. P. FRIEDRICH, M. D., Privatdocent at the University of Leipzig. Authorized translation from the German, edited by H. HOLBROOK CURTIS, M. D., Consulting Surgeon to the New York Nose and Throat Hospital and to the Diphtheria and Scarlet Fever Hospitals. (*Philadelphia: W. B. Saunders & Co., 1900.*)

In these days of extreme specialization in medicine, when many of the leaders in our profession are seriously considering the problems arising from the rapid growth of specialism and the tendency of specialists to ignore the interdependence of abnormal conditions of the general health and of the special organs, it is refreshing and encouraging to read such a book as Friedrich's, in which the preface opens with the statement that, "there is (at present) a laudable tendency to tighten the bonds that unite the daughters to the mother science." However much honor is due the individual worker who devotes his time and energy to the study of special parts of the body, or special diseases, the ideal physician, whether specialist or not, is, unquestionably, he who combines with his special knowledge a broad conception of general medicine. Rarely does one meet with a physician who unites these qualities in his personality to such an admirable degree as does Dr. Friedrich.

Throughout the entire book, the one thing that impresses the reader more than all others, perhaps, is that the author not only possesses a fairly complete knowledge of the specialties under consideration but is able at all times to view the conditions present from the standpoint of the general practitioner; never for a moment losing sight of the most minute detail in the constitutional disturbance.

The author's keen, conservative, impartial judgment in the consideration of all debatable points also impresses the reader. Evidence from all sides is set forth fairly and honestly weighed. When the facts seem to warrant it, a decision on the merits of the case is rendered but always in a spirit of full conservatism.

The first chapter is devoted to a very brief consideration of the anatomical relations existing between the nose, pharynx, larynx and ears, both with regard to continuity of surface and similarity of tissue structure, and to a study of the effects, general and local, of diseases of the respiratory tract. The significance of the upper air passages in the physiology of breathing is given special attention, much emphasis being laid upon the importance of the nose as the respiratory pathway.

Chapters 2, 3 and 4 deal with the alterations in the upper air passages and ears, that may be met with in the course of diseases of the circulatory and digestive systems and of the blood.

Chronic constitutional diseases like rachitis, acromegaly, diabetes and gout are considered in chapter 5. The conflicting theories regarding the etiology of laryngeal spasm and its connection with rachitis are reviewed and the conservative opinion offered that "the most we can say is that spasm of the glottis in children is the expression of an abnormal excitability of all the respiratory muscles, and that it often occurs, in association with tetanic symptoms, in rachitic subjects as the result of digestive disturbances." No one can object to that.

The next two chapters, devoted to the acute and chronic infectious diseases, deserve special mention, but nothing like a satisfactory review can be made in brief. Twenty-five pages are given to tuberculosis alone and are well worth reading. The important rôle played by measles, scarlatina, typhoid, diphtheria and influenza in the causation of suppurative otitis media is thoroughly discussed. In passing, we may mention that the otitis in measles is attributed to the appearance in

the aural mucous membrane of lesions exactly like those seen on the buccal and pharyngeal membranes, showing that it is a part of the general symptom complex and not due to extension of infection through the Eustachian tubes. In scarlatina the extension theory is again cast aside and evidence adduced to show that the aural complications are toxic in character; a parallel being drawn with scarlatinal nephritis.

Syphilis naturally comes in for a large amount of space in the chapter on the skin and sexual organs. The physiologic and pathologic relations between the upper air passages, especially the nose, and the organs of sex are considered and Dr. Mackenzie's article given special reference.

The last chapter is given to nervous diseases, and an appendix follows dealing with the cranial nerves and with the sequelæ of otorrhœa, with reference principally to involvement of the brain, meninges or sinuses.

The book is well printed on excellent paper and is creditable to publisher, author and translator alike. It is not intended for a text-book nor a treatise on special diseases or organs but, as its title implies, is a link to bind the specialist and general practitioner closer together. Its abundant references constitute it a valuable index to the literature of the subjects treated.

H. O. R.

An American Text-book of Physiology. Edited by WILLIAM H. HOWELL, Ph. D., M. D. Second edition, revised. Vol. I. (*Philadelphia: W. B. Saunders & Co., 1900.* Price, $3 net.)

The "American Text-book of Physiology," the first volume of the second edition of which has just appeared, differs in several respects from the text-books of physiology in general use at present. In the first place it is written by a number of men who are investigators in physiology as well as teachers; many of the experiments described and figures and curves reproduced are from the writers' own researches. By the division of the work among a number of contributors, the literature of physiology has been examined first-hand and the results of the most recent investigators incorporated; too many of the text-books offered to students are mere compilations from older and larger works. The fact that the contributors are themselves working physiologists and have gone over the literature of their respective subjects in a critical manner gives the book a freshness and interest seldom found in an elementary text-book. The objection that the treatment of a subject will probably lack uniformity when there are several authors does not seem to have much weight as far as physiology is concerned; at least the want of uniformity in the various sections of this text-book is decidedly less noticeable than that found in most of the books written by individual authors. When the books of the latter class are examined it is found that in almost every case some part of the subject receives what most physiologists consider to be undue emphasis; the part thus treated varies according to the subjects in which the various authors happen to be chiefly interested. In the present case the writers, having comparatively small fields of physiology to cover, have been able to get a better grasp of their part in all its phases than is possible for a man who has the entire subject of physiology to discuss.

The first edition of this text-book, which was published four years ago, appeared in the form of a single volume of over a thousand pages; to many this volume seemed inconveniently large, so that in the present edition the work has been divided into two parts. In the first volume the physiology of the blood, circulation, secretion, digestion, nutrition, respiration and animal heat and the chemistry of the body are considered. The editor has written more than a third of this part, and it seems to the reviewer that this writer's contributions are deserving of special praise; they are characterized by great clearness and accuracy of statement, and the most important points are kept in the foreground while isolated details of minor importance are avoided. In a brief introduction Professor Howell discusses the more general problems of physiology and the composition and general activities of living matter; then follow chapters by the same author on blood and lymph. Before the intricate problem of the formation of lymph is discussed a brief chapter on diffusion and osmosis and other physical processes, discussed from the standpoint of the newer physical chemistry, is introduced. The chapter on the mechanics of the circulation and the movement of the lymph is written by Professor Curtis, while the innervation of the heart and blood-vessels is discussed by Dr. Porter. Porter also contributes a section on the nutrition of the heart, a subject to the knowledge of which he and his pupils have made such important additions. The chapters on secretion, digestion and nutrition and the movements of the alimentary canal, bladder and ureter are written by Howell; the most noticeable feature of these chapters is the incorporation of the recent very valuable work of Pawlow on the relation of the nervous system to the secretion of the digestive glands and the full discussion of the subject of internal secretion. Respiration and animal heat are discussed by Professor Reichert, one of the few physiologists in this country who has had practical experience with the calorimeter. The final chapter of the first volume, on the chemistry of the animal body, is contributed by Professor Lusk; the recent work of Fischer on the purin bases and that of Kossel and his pupils on protamins are fully discussed.

In the second volume, which is to appear shortly, the physiology of muscle and nerve, of the central nervous system, of the sense organs and of reproduction will be discussed. The arrangement of the sections has been altered somewhat in the new edition; one change would seem to call for some comment. In the former edition the physiology of muscle and nerve was the subject first discussed; in the new edition this section is placed in the second volume "so as to bring it into its natural relations with the Physiology of the Central Nervous System." There are undoubtedly some advantages in this change, but it is questionable whether they are not outweighed by certain obvious disadvantages. With the present arrangement the reader meets constant references to the physiology of striped, plain and cardiac muscle, to nerve impulses, sympathetic nerve fibres, etc., before these elementary terms are defined—a manner of presenting the subject few teachers would care to adopt in their lectures.

On the whole this work is certainly the best text-book of physiology for medical students in the English language, and it will doubtless continue to be used generally in all medical schools of the first class.

R. H.

Modern Medicine. By JULIUS L. SALINGER, M. D., and FREDERICK J. KALTEYER, M. D., of Philadelphia. (*Philadelphia: W. B. Saunders & Co., 1900.*)

In this work of 800 pages the authors have endeavored to combine the essentials of physical diagnosis, bacteriology and clinical microscopy as applied to clinical medicine with the general description of diseases as usually taken up in a text-book of medicine. They state that "it has frequently been necessary for the student to procure separate books upon these topics." We hope that it will always be necessary for the student to do so. It is certainly advisable. The man who is studying medicine to-day and is not prepared to have a good text-book of medicine in addition to works on physical diagnosis and clinical methods had better choose some other calling.

In the first 100 pages general symptomatology and semeiology

are considered. This has necessarily been much condensed, but the authors have made the best use of the space. Clinical bacteriology occupies 22 pages, and then about 50 pages are given to laboratory methods. In the description of the methods of examination of the stomach contents no mention is made of Töpfer's test for free hydrochloric acid, nor is the question of ether extraction referred to in discussing Uffelmann's test for lactic acid.

The greater part of the book is taken up with the discussion of disease. Of necessity, the various diseases have to be considered briefly and only the most important points taken up. In the discussion of epidemic cerebrospinal meningitis no mention is made of lumbar puncture, our most valuable means of diagnosis. The writers have evidently been fortunate in their diagnosis of syphilis when they state that "it can scarcely be confounded with any other disease." They probably mean that the diagnosis of a typical case is easy, but it is such general statements, which of necessity have to be made, that constitute the great objection to books of this kind. There is something of everything, but not enough of anything.

Transactions of the American Surgical Association. Vol. XVIII. Edited by DE FOREST WILLARD, M. D., Ph. D., Recorder of the Association. (*Philadelphia: Wm. J. Dornan, 1900.* Cloth. pp. 468. Illustrated.)

This volume of the Transactions of the Surgical Association deals with subjects of much interest in modern surgery and the papers on the whole are of a high degree of merit. The symposium on gastric surgery quite thoroughly covers the subject of surgery of the stomach and contains papers of a great deal of value. The presidential address by Weir of New York embodies the result of much personal experience in the treatment of perforating ulcer of the duodenum and includes the abstracts of 51 cases which have been reported up to the present time. Rodman of Philadelphia discusses hemorrhage from non-perforating gastric ulcer in a thorough manner and has carefully tabulated 40 cases which had been reported up to the time of publication of his paper. Finney discusses perforating gastric ulcer and tabulates the cases which have appeared during the past few months, bringing the subject up to date. Benign obstruction of the pylorus is discussed by Kammerer of New York; malignant disease of the stomach, by Mayo of Rochester, Minnesota; the surgical treatment of dilatation of the stomach, by Curtis of New York; the diagnosis of carcinoma of the stomach, by Hemmeter of Baltimore; and the surgical treatment of hourglass stomach, by Watson of Boston.

The volume also contains reports of some unusual and very interesting cases, including a case of stricture of the œsophagus following typhoid fever which was operated upon by gastrostomy by Dennis of New York; nephrectomy for a large aneurysm of the renal artery, by Keen; removal of acutely inflamed tuberculous mesenteric glands simulating appendicitis, by Richardson, and also by Elliott of Boston.

The present interest in the operative treatment of peritoneal infections in typhoid fever makes the paper by Warren reporting 27 cases of this kind of special interest.

The discussions on the various papers are given in full and contain much that is almost as valuable as the papers, many of which are among the most important contributions to the subjects under consideration which have thus far appeared.

Atlas and Epitome of Diseases caused by Accidents. By Dr. ED. GOLEBIEWSKI, of Berlin. Authorized translation from the German with editorial notes and additions by PEARCE BAILEY, M. D., Consulting Neurologist to St. Luke's Hospital and the Orthopedic Hospital, New York; Assistant in Neurology, Columbia University. 40 colored plates and 100 illustrations in black. pp. 549. (*Philadelphia: W. B. Saunders & Co., 1900.*) Price, $4.

This book undertakes to give a systematic description of the sequels to injuries to all the organs of the body by accidents. It is divided into two parts, one treating of injuries in general, the other of injuries affecting the special structures and regions of the body. The book contains reports of numerous cases of injuries from various causes to illustrate the subjects under consideration, and a large number of fine colored illustrations. It is difficult to see the value of many of the illustrations, however. For example, it hardly seems necessary to devote a whole page cut to show the appearance of the scar resulting from a compound fracture of the femur and ilium or to show the appearance of the cicatrix following an operation in a case of strangulated hernia. Most of the illustrations seem to be of about this character. The text often seems very inadequate and inaccurate; for example, under hernia, we are told that "the external protrusion of any part of the intestine out of the abdominal cavity or its escape into another body cavity is called a hernia," without any reference to the possibility of omental hernia, hernia of the bladder and of other organs. Very much of the text will have little value for most physicians. The following is an example: "Incised wounds are produced by pieces of glass, sharp pieces of tin, by knives, saws, pieces of slate, etc. The greatest possible variety of wounds of the forearm is met with in workmen employed in the various trades and manufactures." Considerable space is devoted to a discussion of the length of time usually required for recovery from various injuries, the amount of loss of function and the allowance of insurance. Indeed, the book seems to be designed chiefly for German readers, the need of such a text-book arising from the law in Germany insuring all workmen against injury. Although the book contains reports of many interesting cases, we believe it will hardly prove of great value to the average American reader.

Elements of Clinical Bacteriology for Physicians and Students. By Drs. E. LEVY and F. KLEMPERER. Second edition, translated by Dr. AUG. A. ESHNER. (*Philadelphia: W. B. Saunders & Co., 1900.*)

This book, originally published in Germany and presented in English to the profession and students of America in a clear and comprehensible manner, is well classified and written, and contains numerous illustrations of an excellent kind.

Compared with many books of like nature in use in this country, it cannot be said to be their peer. And judged by the most recent American standards, its presentation of many technical details is found in some degree to be lacking in accuracy and compass. Nevertheless, a perusal of its pages will reveal interesting matter, such as the articles on botulism, the mycoses and disinfection. N. MACL. H.

Saunders Pocket Medical Formulary, with an Appendix containing posological table; formulæ and doses for hypodermic medication; poisons and their antidotes; diameters of the female pelvis and fœtal head; obstetrical table; diet list for various diseases; materials and drugs used in antiseptic surgery; treatment of asphyxia from drowning; surgical remembrancer; tables of incompatibles; eruptive fevers; weights and measures, etc. By WILLIAM M. POWELL, M. D. Sixth edition, thoroughly revised. (*Philadelphia: W. B. Saunders & Co., 1900.*)

The object of this neatly printed and attractive book is so well set forth in the title that little comment is necessary. It does not seem so much a formulary as a remembrancer, and it will be mainly useful as bringing to mind procedures and remedies which in the strenuous life of the busy practitioner are sometimes overlooked. It is well arranged for easy reference.

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